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PROCEEDINGS

OF THE

GENERAL MEETINGS FOR SCIENTIFIC BUSINESS

OF THE

ZOOLOGICAL SOCIETY OF LONDON.

January 17, 1893.

Sir W. H. Flower, K.C.B., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of December 1892:—

The total number of registered additions to the Society's Menagerie during the month of December was 43, of which 18 were by presentation, 23 by purchase, and 2 on deposit. The total number of departures during the same period, by death and removals, was 140.

Mr. F. C. Selous, C.M.Z.S., exhibited the skull of an Antelope believed to be a hybrid between the Sassaby (*Bubalis lunata*) and the Hartebeest (*B. caama*), which he had transmitted to the British Museum in 1890, and read the following letter which he had addressed to Dr. Günther on the subject, dated Tati River, Matabeleland, March 23rd, 1890:—

"I am sending you the skull of a very curious animal which would puzzle you immensely if I did not tell you what it was. It is the skull of a male cross-bred animal, between a Tsessebe Antelope (*Bubalis lunata*) and a Hartebeest (*B. caama*), the father probably being one of the former Antelopes and the mother one of the latter. This animal was shot a few miles from here, between the Tati and Shashi rivers, by my old friend Cornelius van Rooyen, the well-known Boer hunter. You will see that the skull of this animal closely resembles that of a Hartebeest, whilst the horns are neither like those of a Hartebeest nor those of a Tsessebe, but partake of the characters of both, standing nearly straight up from the skull

as in the Hartebeest, but yet being slightly lunate in form and ringed as in the Tsessebe. As regards the animal itself, van Rooyen tells me that the colour of its skin on the body, head, and legs was precisely the same as in an ordinary Tsessebe, but that it had the



Head of supposed hybrid Antelope between *Bubalis lunata* and *B. caama*.

comparatively large bushy tail of a Hartebeest. When it ran, it ran with its tail held out as Hartebeests do, and with the light springy gallop of those animals. There can, I think, be no doubt in the mind of any rational being that this curious animal is a cross between the Hartebeest and Tsessebe Antelopes. . . . ."

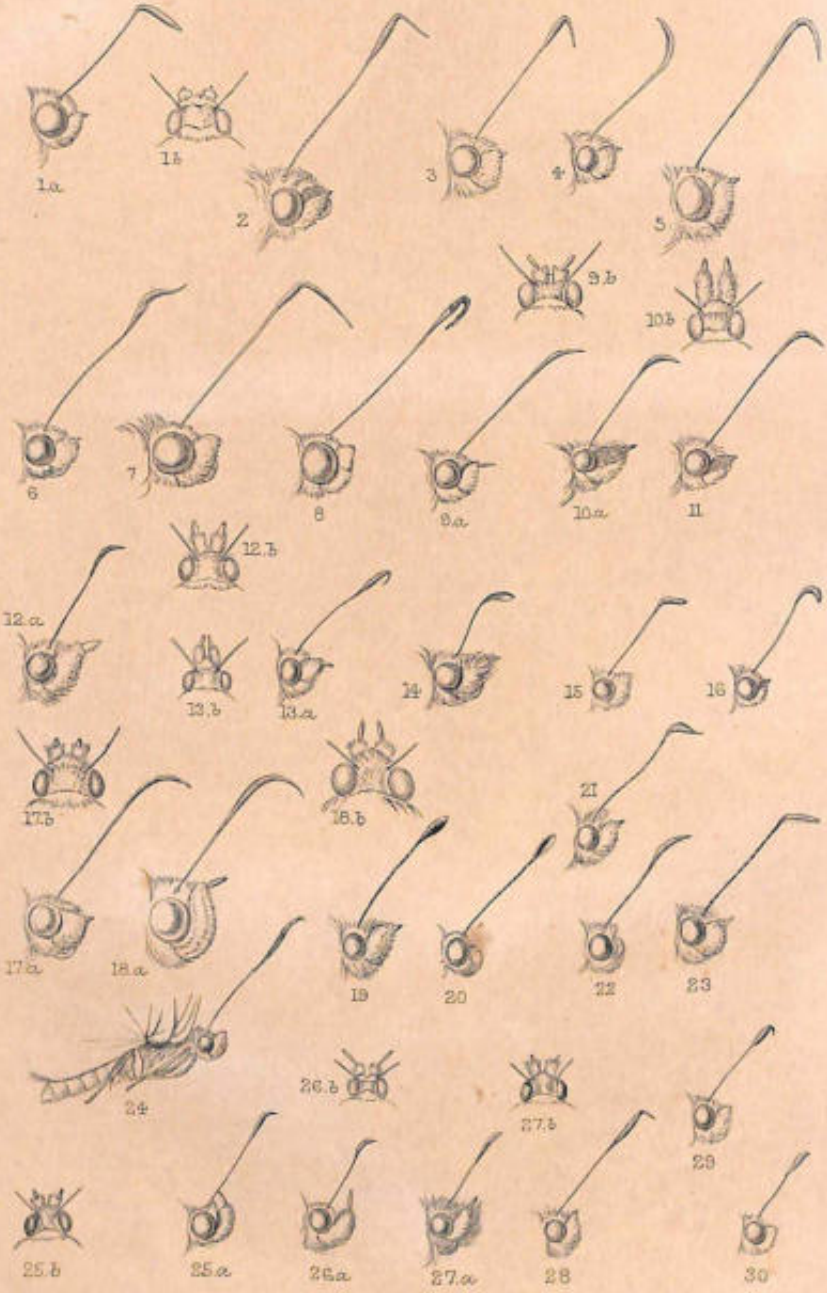
"P.S.—You will notice that the prominent rings on the horns I am sending you agree with those which are present just at the backward turn of the horns of a Hartebeest."



H.Knight del et lith.

West, Newman imp.

Structure of the Hesperiidæ



H.Knight del. et lith.

West, Newman imp.

Structure of the Hesperiidæ

Mr. Oldfield Thomas exhibited three adult specimens, a male and two females, of the Bornean Monkey recently described by him under the name of *Semnopithecus cruciger*[1]. These specimens showed that this Monkey was after all fully as large as *S. chrysomelas* and *S. hosei*, the adult male having a body 520 mm. and a tail 700 mm. in length; so that the typical skin must have been decidedly immature. In the male specimen the coloration was almost exactly similar to that of the type, but in the two females the broad black dorsal line was interrupted just below the level of the shoulders for a distance of two or three inches, the hairs being here red as on the flanks, but still intermixed with black. In all three also there was a blackish patch on the postero-internal side of the lower leg, but this patch varied in its intensity, and was not visible in the type. The crest in these specimens was much more developed than in the younger example, the hairs on the occiput attaining a length of nearly three inches, and being mixed black and red, owing to the red crown hairs mingling with the black ones of the anterior end of the dorsal black line.

These specimens had been taken on the Batang Hupar River, Western Sarawak, in August 1892, by one of Mr. Hose's collectors; and Mr. D. J. S. Baily, a resident in the neighbourhood, had informed Mr. Hose that he had often seen black and red Monkeys, presumably of this form, in the forests of the district.

In spite of the confirmation given by these facts, Mr. Hose himself was inclined to think that *S. cruciger* might be only a red form or "erythrism" of *S. chrysomelas*, the common black and white Monkey of Sarawak, in the company of which he believed he had seen the specimen first described by Mr. Thomas. Mr. Hose pledged himself specially to investigate this most interesting question on his return to Borneo.

The following papers were read:—

1. A proposed Classification of the *Hesperiidæ*, with a Revision of the Genera. By Lieut.-Col. E. Y. Watson, late Madras Staff Corps, F.Z.S., F.E.S.

[Received October 27, 1892.]

(Plates I.–III.)

The arrangement here proposed is based entirely upon the collection of the British Museum; therefore only the species represented in the National Collection are referred to their respective genera, those species of which the types are in the collection being marked with an asterisk.

As the time at my disposal has been strictly limited, only such new genera have been described as differ very markedly from those

[1] Ann. Mag. N. H. (6) x. p. 475 (1892).

already established; so that it will be found that there are many species noted below for which new genera have not been erected, but which have been placed in that genus to which they seem most closely allied. In addition to the collection of the British Museum, free access has been afforded me to the valuable collection of Messrs. Godman and Salvin, to whom my best thanks are due for their courtesy and kind assistance.

The system of numbering the veins has been adopted in the descriptions for brevity and clearness, and, as this system is not in universal use, the veins in the first figure of neuration have been numbered to exemplify the method.

Before 1874 no serious attempt had been made to arrange the genera of the Hesperiidæ in natural groups, but since that time several arrangements, though in most cases only relating to a limited fauna, have been proposed.

The only suggested arrangement which seems to be perfectly natural is that proposed by Scudder in the Bulletin of the Buffalo Society of Natural Science [1], and afterwards worked out more completely in his 'Butterflies of New England.' Though it is only for the Hesperiidæ of New England that this arrangement is fully worked out, yet, on examination, it has been found, with certain modifications, applicable to the Hesperiid genera of the world, and has accordingly been adopted in this paper. In this arrangement Scudder divides the genera of New England Hesperiidæ into two groups, which he names respectively *Hesperidi* and *Pamphilidi*. These two divisions are based to a very large extent on the secondary sexual characters of the male imago, the egg, larva, and pupa supplying subsidiary characters; these latter, however, are, as pointed out, of a slight and ill-defined character, and would be inapplicable generally, since, in the great majority of the genera, little or nothing is known of the earlier stages. The male characters are, however, sufficient in themselves to enable the majority of the genera to be easily assigned to the respective groups, and where no secondary sexual characters exist the neuration or habits supply the necessary information.



M. Mabille has further amplified this arrangement of Scudder's in a paper on the Hesperiidæ in the Brussels Museum, wherein he further subdivides the main divisions and assigns additional genera to their respective groups. These further subdivisions have unfortunately been only very partially characterized, owing, as M. Mabille himself states, to his investigations not being completed.

In the allocation of many genera I have found it necessary to entirely differ from M. Mabille's conclusions; for instance, nearly all those genera which Mabille includes under his subdivisions "*Ismenini*" and "*Tagiadini*," and assigns to the *Astyci*=*Pamphilidi* (Scudder), should, in my opinion, be transferred to the *Hesperidi* (Scudder), with which their habits and neuration better agree, and Mabille's "tribe" *Pyrrhopygini* be erected into a group of equal

[1] Bull. Buff. Soc. Nat. Sc. vol. i. pp. 195–196 (1874).
[2] Ann. Soc. Ent. Belge, vol. xxi. p. 12 *et seq.* (1878).

importance to Scudder's *Hesperidi* and *Pamphilidi*, this latter being an alteration already suggested by Scudder himself.

Passing by the arrangement of Plötz, which, being based largely on the pattern of the wings, has been found quite unworkable, and that of Distant, which was a tentative one only intended to be applied to the fauna then under consideration, we come to a valuable paper[1] by Speyer on the "Genera of the Hesperiidæ of the European Fauna." In this paper he makes a suggestion which has been found of the very greatest importance in the classification of the genera; this suggestion was to the effect that the position of vein 5 of the fore wing in relation with veins 6 and 4 would probably prove a character of value. This surmise has proved to be correct, and the position of vein 5 has been found of great use in the arrangement of the Hesperiidæ, as it has already proved to be for the division of the Heterocera into two large groups of families.

In the following arrangement it has been attempted to make mention of every generic name published prior to 1892, and to point out its type species, though, where this species has not been accessible, it has not been possible in most cases to assign the genus to its correct position. This is in great part owing to the very superficial manner in which some, even recent, authors characterize their genera, in many cases doing no more than specifying the species they propose as their type, so that when one is not in possession of that particular species the genus is quite unrecognizable.

Whenever no particular species has been designated by the author of a genus as his type of that genus, it has been found most satisfactory to follow Scudder's 'Historical Sketch of the Genera of Butterflies,' published in 1875, as in that work he has investigated the history of the genera from the earliest authors, and has fixed the types in accordance with the strictest rules of priority, and therefore in the opinion of the writer his decisions should be accepted by all subsequent authors, who will thus have a sound basis to start from, and a uniform system would result instead of the chaos which is caused by each author arbitrarily fixing the type of the genera of earlier authors on a system of his own.

The decisions of Mr. Scudder have therefore been accepted for all genera included in the above-quoted work; while for those genera which have been described subsequently, when no type has been specified, that species has been taken which best agrees with the diagnosis of the genus. In the great majority of genera it has been found practicable to clear the wings of a specimen of the typical species, whereby its diagnosis has been considerably facilitated.

In all, 234 generic names have been dealt with, of which 49 are sunk as synonyms, while 45 new genera have been described, and at least as many more await description in British collections alone.

As in the British Museum collection the two genera *Megathymus* and *Ægiale* are arranged in the Heterocera, they are not included below, though some authors consider they should be treated

[1] Stett. ent. Zeit. vol. xl. p. 477 *et seq.* (1879).

as Hesperiidæ; the Australian genus *Euschemon*, which is furnished with a frenulum, one of the most distinctive characters of the Heterocera, has also been omitted; should subsequent authors consider these three genera are more naturally placed in the Hesperiidæ, it will be necessary to establish two additional subfamilies for their reception.

With regard to the vexed question of the generic importance of male secondary sexual characters, the conclusion which has been forced upon me is that, in any particular genus in which male secondary characters are found, the particular male character (be it costal fold, discal stigma, or tuft of hairs) may be either present or absent in different species of that same genus, but is never replaced by a character of different structure. Of the inconstancy of the male character in the same genus the following are examples:—*Eudamus*, *Thorybes*, *Hesperia*, *Urbanus*, *Ismene*, *Hasora*, *Kerana*, *Padraona*, *Taractrocera*, *Chapra*, *Baoris*, *Halpe*, and many others might be brought forward; but on the other hand it is difficult to quote a single genus in which the male character is replaced by another of similar character, and in a few cases where this is apparently the case in the following paper, it is owing to new genera not having been erected for the aberrant forms though manifestly distinct, time not allowing of the critical examination necessary.

On every other occasion when the male secondary character differs in structure, an accompanying difference will be found in the neuration, antennæ, or other point of structure.

The above being the case, the costal fold, discal stigma, or other structural peculiarity of the male insect, though frequently not a generic character, is yet of the greatest importance in the formation of groups or subfamilies, and, as has already been pointed out by Scudder, all those species which are provided with a costal fold belong to the *Hesperiinæ*, and all those provided with a discal stigma to the *Pamphilinæ*.

Though the above conclusion is not in accordance with the theory of many authors, yet it will be found that no author can be quoted who does not admit it in practice; for instance, Scudder places *bathyllus* and *pylades* in the same genus *Thorybes*, though the former is without a costal fold and the latter is provided with one; Mabille, in his paper above quoted, includes in the genera *Thymele*, *Eudamus*, *Æthilla*, *Ismene*, *Pamphila*, and others species both provided with and devoid of male secondary characters; Moore, who is one of the strongest advocates for the generic importance of male characters, yet, under the same generic name *Thanaos*, describes *indistincta* and *stigmata*, the former of which lacks the discal stigma of the latter, includes in his own genus *Halpe* the species *radians*, though without the discal band characteristic of the genus, describes *atkinsoni*, *subtestaceus*, *nilgiriana*, and *vindhiana*, all as belonging to the genus *Isoteinon*, though the two former possess a tuft of hairs on the fore wing which is wanting in the latter, and acts similarly on several other occasions; while Distant and Trimen in their respective works allow to male characters no generic importance

whatever. Mr. de Nicéville also informs me that though he would attach more importance to the male-marks in Hesperiidæ and Lycænidæ than in other families, yet he considers that each case must be judged on its merits.

While referring to this subject, it seems worth calling attention to the very few Old World genera which are provided with a costal fold on the fore wing, those provided with a discal streak or other character largely predominating, while in the New World the numbers of each group seem fairly equal.

The characters which have been found of the greatest value in dividing the family into groups or subfamilies are (the *Pyrrhopyginæ* being first excluded on their abnormal antennæ) firstly the position of vein 5 of the fore wing, taken in conjunction with the length of the cell, this vein in the *Hesperiinæ* being invariably nearer to 6 than to 4 when the cell of the fore wing is less than two-thirds the length of costa, and only nearer to 4 when the cell is more than two-thirds the length of costa; while in the *Pamphilinæ* vein 5 of the fore wing is never nearer to 6 than to 4 except in a few aberrant Australian genera, and usually is very much nearer to 4, in a few cases only being practically equidistant between the two veins, while on the other hand the cell of the fore wing never exceeds two-thirds of the length of the costa, except in one or two Asiatic genera of the *Ismene* group, which are readily distinguished from all *Hesperiinæ* by their peculiar palpi and antennæ.

The presence or absence of vein 5 of the hind wing has been found of no importance as a character for groups of genera, as it occurs in all stages of development in closely allied genera; it has, therefore, only been treated as present when it has been fully developed into a tubular vein, and in all other cases has been treated as absent, though it is usually just traceable as a fold or weak vein, being only absolutely invisible in some genera of *Pamphilinæ*, chiefly those in which vein 5 of the fore wing is very close to the bottom of the cell. It is noteworthy that there is no genus of *Pamphilinæ* or the *Hesperiinæ* occurring in the New World in which vein 5 of the hind wing is fully developed into a tubular vein, the only New World genera in which this vein is developed being the Pyrrhopygine genera *Amenis* and *Ardaris*, the former of which would appear to be in a transitional state, the development of the vein varying individually in the same species.

The presence or absence of the tibial epiphysis on the fore legs has only been found of secondary importance, varying in some cases in different species of the same genus, and apparently being present or entirely wanting in different individuals of *Abantis tettensis*, Hopff.

On the hind tibiæ both terminal and medial pairs of spurs are almost invariably present, and the absence of the middle pair is usually of generic importance, though in the genera *Cyclopides*, *Heteropterus*, and *Pythonides* the absence of this pair of spurs is only of specific value.

Another character of the greatest importance is the position

assumed by the species when in a state of complete repose; and it will be found that all those species which are known to rest with their wings expanded fall naturally into the *Pyrrhopyginæ* or *Hesperiinæ*, and in no single instance into the *Pamphilinæ*, and only in very few instances are species of these two subfamilies known to rest with their wings raised over their backs.

The only other character which has been found of importance is the description of secondary male characters found on the upper side of the fore wing, and this is limited in its value by there being in many genera no secondary male characters on the fore wing. However, the costal fold is never found except among the *Hesperiinæ*, and the discal stigma of whatever form never except among the *Pamphilinæ*; other male characters, such as tufts and patches of modified scales on the underside of the fore wing, either side of the hind wing, or on the legs, appear to be shared in common by both *Hesperiinæ* and *Pamphilinæ*.

There is little doubt that when more is known of the earlier stages of the family other characters will be found, but at present it is quite impracticable to generalize from the few facts known. A little has been done in this direction by Scudder in the 'Butterflies of New England,' but only very few genera are referred to, and the characteristics there given as peculiar to the *Hesperiinæ* and *Pamphilinæ* do not seem to hold when applied to the few Old World species of which it has been found practicable to examine the earlier stages; no mention of these stages has therefore been made in the present paper, pending fuller investigations.

The terms used in the descriptions are as follows:—the antennæ are called "hooked" when the terminal portion of the club is bent to less than a right angle with the remaining portion of the club, and "sickle-shaped" when the whole of the club is evenly curved and not abruptly angled; when the club is abruptly angled but not "hooked" it is spoken of as simply "bent." The palpi are termed "porrect" when the third joint is extended horizontally in front of the face in continuation of the axis of the body, "erect" when the third joint is extended perpendicularly in front of the face at right angles to the axis of the body—in this case the third joint frequently curves back over the vertex—and "suberect" when the third joint of the palpi lies at less than a right angle with the axis of the body. These terms are only used when the third joint is more or less conspicuous and its direction obvious; in the majority of genera the third joint is very short and inconspicuous, and in describing these no mention is made of its direction, which is in many cases difficult to definitely point out, and would render the diagnosis liable to misconception. In comparing the length of the cell with the length of the costal margin, the latter is measured in a straight line from the base of the wing to the apex, and the former from the base of the wing to the upper angle of the cell. The length of the inner margin is measured in a straight line from the base of the wing to the outer angle, and the outer margin in a straight line from the outer angle to the apex of the wing. The veins are treated as

arising at where they bifurcate from the main trunks: *i. e.* veins 1 and 12 of the fore wing, and 1 *a* and 1 *b* of the hind wing, are treated as arising from the base of the wing; veins 2 and 3 of both wings as arising from their bifurcation with the median; veins 7, 8, 9, 10, 11 of the fore wing and 7 and 8 of the hind wing as arising from their bifurcation with the subcostal; veins 6 and 4 of both wings as arising at the points where they are met by the middle and lower discocellulars respectively; and, lastly, vein 5 of both wings as arising at the junction of the middle and lower discocellulars. The median from the base of the wing to the lower angle of the cell is termed the "lower margin of the cell," and the subcostal from the base of the wing to the upper angle of the cell the "upper margin of the cell."

In the generic keys to the several sections the more superficial and readily recognizable characters have been constantly employed; the male secondary sexual characters, though used frequently, being taken only where the same character is found throughout the whole genus.

It has been found impracticable to arrange the genera in their natural order in the keys, so the genera of each section are numbered in the order which seems most natural, and the descriptions are arranged to accord with these numbers.

The following three subfamilies have been adopted in this arrangement, detailed descriptions of which will be found in the text, while they may be briefly compared as follows:—

PYRRHOPYGINÆ.—This is a well-marked group of closely allied genera confined entirely to the New World, which can be readily recognized by the large blunt club to the antennæ, which is a constant character. The cell of the fore wing is also invariably very long, being more than two-thirds the length of the costa. Vein 5 of the fore wing is usually nearer to 4 than to 6. When at rest they extend all their wings horizontally.

HESPERIINÆ.—This group includes all species with a costal fold in the male, all species in which vein 5 of the fore wing is nearer to 6 than to 4, and all species which rest with their wings extended horizontally. Some few species rest with their wings raised above the back, but these are very few and can invariably be recognized by the costal fold or some other character; also, in a considerable number of genera in which the cell is more than two-thirds the length of the costa, vein 5 is usually slightly nearer to 4 than to 6; this is occasioned by the upper angle of the cell being produced, and the middle discocellular consequently elongated. These genera, however, are readily recognized by the length of the cell, as in the *Pamphilinæ*, where it is only in a very few well-marked genera that the cell exceeds two-thirds of the costa.

The antennæ, almost without exception, end in a fine point, and in the few genera in which this is not the case the cell is invariably short.

PAMPHILINÆ.—This group includes all species with a discal band on the fore wing of the male, and all species in which vein 5 of the

fore wing is nearer to 4 than to 6, with the exception of those noted above. When in a complete state of repose all the species of this group rest with their wings raised above their backs; but when only sunning themselves, in many species the fore wings are elevated and the hind wings depressed. The cell of the fore wing is almost invariably less than two-thirds the length of the costa, and the antennæ almost invariably end in a fine point.

Subfamily I. Pyrrhopyginæ.

Antennæ: club very thick, ending in a blunt point, usually more or less bent into a hook. Palpi: second joint densely scaled, closely pressed against the face; third joint naked, minute. Cell of fore wing always more than two-thirds the length of costa. No costal fold or other secondary sexual characters on fore wing of male. Vein 5 of fore wing nearer to 4 than to 6. Vein 5 of hind wing usually wanting. Hind tibiæ usually with two pairs of spurs.

The thick blunt club to the antennæ will at once distinguish this subfamily: a few of the lower genera of *Hesperiinæ* and some Australian *Pamphilinæ* have a somewhat similar club; but in them the cell of fore wing is invariably less than two-thirds the length of costa.

This subfamily exactly coincides with the *Pyrrhopygini* of Mabille, which he places as a section of his *Hesperidi*; however, its characteristics are so well marked that it has here been treated as a subfamily of equal value with the *Hesperiinæ* and *Pamphilinæ*. Little or nothing is known of the early stages of this subfamily, but the perfect insect seems in many ways to have affinities to both *Hesperiinæ* and *Pamphilinæ*, and its correct position is a matter of some doubt. According to Westwood and Hewitson, the perfect insect rests with its wings extended horizontally.

The whole group would also appear to be protected, as a large number of the species are mimicked very markedly by *Erycides* and its allies and also by some species of *Pamphilinæ*.

This subfamily is confined entirely to South and Central America.

Synopsis of Genera of Pyrrhopyginæ.

A. Middle and lower discocellulars of fore wing very oblique.
  a. Club of antennæ much thickened.
    a^1. Vein 5 of hind wing wanting.
      a^2. Vein 3 of fore wing less than twice as far from 2 as from 4.
        a^3. Vein 3 of hind wing from before end of cell.
          Pyrrhopyge, Hb. Type, *hyperici*, Hb. (1)
        b^3. Vein 3 of hind wing from beyond end of cell.
          Mysoria, g. n. Type, *acastus*, Cramer. (2)
      b^2. Vein 3 of fore wing more than twice as far from 2 as from 4.
        a^3. Vein 3 of hind wing from before end of cell.
          Yangunia, g. n. Type, *spatiosa*, Hew. (4)
        b^3. Vein 3 of hind wing from end of cell.
          a^4. Cell of hind wing short, not reaching half across wing.
            Mimoniades, Hb. Type, *iphinous*, Latr. (9)

b^4. Cell of hind wing long, reaching more than half across wing.
Amenis †, g. n. Type, *pionia*, Hew. (3)
c^3. Vein 3 of hind wing from beyond end of cell.
Sarbia, g. n. Type, *xanthippe*, Latr. (6)
c^2. Vein 3 of fore wing more than three times as far from 2 as from 4.
a^3. Vein 3 of hind wing from end of cell.
Mahotis, g. n. Type, *nursia*, Swains. (5)
b^3. Vein 3 of hind wing from before end of cell.
Jemadia, g. n. Type, *patrobas*, Hew. (8)
b^2. Vein 5 of hind wing well developed.
Ardaris, g. n. Type, *eximia*, Hew. (7)
b. Club of antennæ comparatively slender.
a^1. Veins 7 and 8 of fore wing anastomosing shortly.
Microceris, g. n. Type, *variicolor*, Mén. (11)
b^1. Veins 7 and 8 of fore wing free.
Myscelus, Hb. Type, *nobilis*, Cram. (12)
B. Middle and lower discocellulars of fore wing almost erect.
Oxynetra, Feld. Type, *semihyalina*, Feld. (10)

1. Genus Pyrrhopyge. (Plates I. fig. 2; III. figs. 1 *a*, *b*.)

Pyrrhopyge, Hübner, Verz. bek. Schmett. p. 103 (1816).
Type, *hyperici*, Hübn.

Tamyris, Swainson, Zool. Ill. i. t. 33 (1820–21).
Type, *zeleucus*, Fabr.

Pachyrhopala, Wallengr. K. Vet.-Akad. Förh. xv. 81 (1858).
Type, *phidias*, Linn.

Club of antennæ ovoid, very much thickened, bluntly pointed, usually bent into a hook. Fore wing: no costal fold in male but costa much thickened; cell rather more than two-thirds length of costa; vein 10 nearer to 11 than to 9; veins 6 and 7 from upper angle of cell; vein 8 from just before it; upper discocellular minute, middle one about half as long again as lower; middle and lower discocellulars inwardly oblique, the middle slightly more oblique than the lower and rather better developed; vein 5 nearer to 4 than to 6; vein 3 about half as far again from 2 as from end of cell. Hind wing: cell not reaching to the middle of the wing; vein 7 well before upper end of cell, about three times as far from base as from end of cell, rather more remote from base than 2; discocellulars almost erect, slightly concave outwardly; vein 5 wanting; vein 3 from just before end of cell; vein 2 almost equidistant from base of wing and from end of cell. Hind wing: outer margin even or slightly crenulated, produced more or less into an anal lobe, which in some species is well marked though small. Hind tibiæ with two pairs of spurs, the upper pair minute.

hyperici, Hübn.	1.	* *gazera*, Hew.	6.
* *aræthyrea*, Hew.	2.	*papius*, Hopff.	6 *a*.
* *aziza*, Hew.	3.	* *charybdis*, Westw.	7.
* *gorata*, Hew.	4.	*scylla*, Mén.	8.
sergius, Hopff.	5.	*menecrates*, Mab.	9.

† In *Amenis* vein 5 of the hind wing is sometimes well developed, but the genus can be readily separated from *Ardaris* by the hind tibiæ being provided with two pairs of spurs, the terminal pair only being present in *Ardaris*.

zeleucus, Fabr. ..... 10.
phidias, Linn. ..... 11.
mænas, Fabr.
* *latifascia*, Butl. ..... 12.
* *flaminis*, Butl. ..... 13.
* *passova*, Hew. ..... 14.
* *gortyna*, Hew. ..... 15.
jonas, Feld. ..... 16.
cydonia, Druce.
* *zereda*, Hew. ..... 17.
chalybea, Sc. ..... 18.
æsculapius, Staud. ... 19.
variegaticeps, G. & S.
hygieia, Hew. ..... 20.
* *amra*, Hew. ..... 21.
josepha, Plötz ..... 21 *a*.
amyclas, Cram. ..... 22.
* *phylleia*, Hew. ..... 23.
* *hadassa*, Hew. ..... 24.
* *telassa*, Hew. ..... 25.
* *martena*, Hew. ..... 26.
creona, Druce ..... 27.
* *galgala*, Hew. ..... 28.
* *maculosa*, Hew. ..... 29.
* *araxes*, Hew. ..... 30.
* *lelita*, Hew. ..... 31.

And three unidentified species.

2. Genus Mysoria, nov.

Type, *acastus*, Cramer.

Antennæ as in *Pyrrhopyge*. Fore wing much more elongate; costa more than half as long again as inner margin; cell almost three-fourths the length of costa. Vein 3 only slightly nearer to end of cell than to vein 2; the rest of the neuration much as in *Pyrrhopyge*. Hind wing: cell very short; vein 3 well beyond end of cell, as far beyond as 2 is before it; vein 7 well before end of cell, slightly longer than vein 2. Hind tibiæ with two pairs of spurs.

acastus, Cramer ..... 1.
venezuelæ, Scudder ..... 2.
barcastus, Sepp. ..... 3.
**verbena*, Butler.
thasus, Cramer ..... 4.

3. Genus Amenis, nov.

Type, *pionia*, Hew.

Antennæ as in *Pyrrhopyge*. Fore wing: as in *Pyrrhopyge*, but vein 3 given out much nearer the end of the cell, more than twice as far from 2 as from 4. Hind wing: cell reaching rather beyond the middle of the wing; vein 3 from end of cell, not before it; vein 7 just before end of cell. Hind tibiæ with two pairs of spurs.

* *pionia*, Hew. .... 1.
ponina, H.-S. ..... 2.

In this genus vein 5 of the hind wing is more or less developed, and seems to vary individually; in the single female that I have seen it was practically absent.

4. Genus Yanguna, nov.

Type, *spatiosa*, Hewitson.

Antennæ as in *Pyrrhopyge*. Fore wing: vein 3 more than twice as far from 2 as from 4. Hind wing: cell not reaching middle of wing; vein 7 rather more than twice as far from base as from end of cell; vein 3 from before end of cell; vein 2 less than twice as

far from base as from end of cell. Hind tibiæ with two pairs of spurs.

* *spatiosa*, Hew. ..... 1.
cometes, Cram. ... 2.
* *thelersa*, Hew.

rubricollis, Sepp ... 3.
* *hadora*, Hew.
arinas, Cram. ..... 4.
* *pedaia*, Hew.

5. Genus Mahotis, nov.

Type, *nurscia*, Swainson.

Antennæ as in *Pyrrhopyge*. Fore wing: veins 6, 7, and 8 from upper angle of cell; middle discocellular very oblique, lower discocellular slightly arched; vein 3 three times as far from 2 as from 4. Hind wing: cell reaching slightly beyond the middle of the wing; vein 7 well before end of cell; discocellulars distinct; vein 5 wanting; vein 3 from end of cell; vein 7 shorter than 2. Hind tibiæ with only the terminal pair of spurs.

nurscia, Swainson ..... 1.
crida, Hew. ..... 2.

6. Genus Sarbia, nov.

Type, *xanthippe*, Latreille.

Antennæ as in *Pyrrhopyge*; palpi also similar, but the third joint even less prominent than in that genus, being almost entirely concealed by the scales of the second joint. Fore wing: much as in *Pyrrhopyge*, but vein 3 more than twice as far from 2 as from 4. Hind wing: cell very short, reaching to considerably less than half across wing; vein 3 far beyond end of cell, only about half as long as vein 2; vein 2 almost equidistant from base of wing and end of cell; vein 7 well before end of cell, more than three times as far from base of wing as from vein 6. Hind tibiæ with two pairs of spurs.

xanthippe, Latr. ..... 1.
spixi, Plötz ..... 1 *a*.
antias, Feld. ..... 2.
* *oneka*, Hew. ..... 3.

And one unidentified species.

7. Genus Ardaris, nov. (Plate 1. fig. 1.)

Type, *eximia*, Hew.

Antennæ as in *Pyrrhopyge*. Fore wing: middle and lower discocellulars subequal, inwardly oblique and in the same straight line; vein 2 remote from base of wing, about equidistant from vein 3 and base of wing; vein 3 twice as far from 2 as from end of cell. Hind wing: vein 7 well before end of cell; discocellulars distinct; *vein 5 from their middle*; vein 3 from end of cell; vein 2 rather nearer to end of cell than to base of wing. Hind tibiæ with only the terminal pair of spurs.

* *eximia*, Hew. ..... 1.

Little is known of the habits of this section, and, of those of which there is any record, some seem to rest with their wings over their backs, and some with them extended flat.

This section is confined almost entirely to the New World; only seven of the genera occur in the Old World, and these are only represented by one or two species each.

The male is usually provided with a costal fold on the fore wing and never with a discal stigma, occasionally with a tuft on one of the wings, and very frequently with a tuft of long hairs attached to the hind tibiæ, which are usually, but not invariably, furnished with two pairs of spurs. The epiphysis on the fore tibiæ is invariably present.

Section B.

Antennæ seldom hooked, occasionally bluntly pointed. Palpi, third joint either minute or porrected in front of the face, in the latter case stout, and not slender as in the *Entheus* group in Section A; palpi never curving over the vertex.

Fore wing: cell less than two-thirds the length of costa; vein 5 invariably nearer to 6 than to 4. Hind wing frequently lobate, but never with a distinct tail or tooth at the submedian; vein 5 never fully developed.

This section can be readily separated by the position of vein 5 of the fore wing together with the short cell.

All the species of this group of which there is any record (with the exception of a few species of *Hesperia*) rest with their wings extended flat when in a state of complete repose, frequently settling on the underside of a leaf.

This section occurs throughout both the New and the Old Worlds, some of the genera having a very wide range. Most of the New-World forms and a few of the Old-World ones are provided in the male with a costal fold on the fore wing, and never with a discal stigma. A very large number of the genera are also provided in the male with a tuft of long hairs attached to the hind tibiæ or fore coxæ. There are invariably two pairs of spurs on the hind tibiæ, and the epiphysis of the fore tibiæ is invariably present, with the doubtful exception of some individuals of *Abantis tettensis*.

Synopsis of Genera of HESPERIINÆ.

Section A.

a. Hind tibiæ with two pairs of spurs (except in *Tarsoctenus* * and *Casyapa* *).

a^1. Third joint of palpi minute, bluntly conical.

a^2. Hind wing conspicuously tailed at vein 1 *b*.

a^3. Male with a tuft of hairs on underside of fore wing.

POLYTHRIX, g. n. Type, *metallescens*, Mab. (1)

b^3. No tuft of hairs on underside of fore wing in male.

EUDAMUS, Swains. Type, *proteus*, Linn. (2)

* The form of the antennæ alone will readily distinguish these two genera from the remaining genera in this section which have only one pair of spurs on the hind tibiæ.

b^2. Hind wing with no tail, but with a projecting tooth at vein 1 *b*.
a^3. Antennæ sickle-shaped. PLESTIA, Mab. Type, *staudingeri*, Mab. (4)
b^3. Antennæ more or less hooked (except in some species of *Heteropia*).
a^4. Hind tibiæ with only terminal pair of spurs.
TARSOCTENUS, g. n. Type, *plutia*, Hew. (5)
b^4. Hind tibiæ with both pairs of spurs.
a^5. Lower discocellular of fore wing strongly arched.
PHOCIDES, Hübn. Type, *palemon*, Cram. (6)
b^5. Lower discocellular of fore wing straight.
a^6. Male with a tuft of hairs on underside of fore wing.
HYPOCRYPTOTHRIX, g. n. Type, *teutas*, Hew. (7)
b^6. No tuft of hairs on underside of fore wing in male.
a^7. No tuft of hairs on upperside of hind wing in male.
a^8. Apex of fore wing truncate, the outer margin angled at vein 5.
a^9. Male with a costal fold on fore wing.
a^{10}. Vein 3 of hind wing immediately before the end of cell.
SPATHILEPIA, Butl. Type, *clonius*, Cram. (9)
b^{10}. Vein 3 of hind wing well before end of cell.
EPARGYREUS, Hübn. Type, *tityrus*, Fabr. (10)
b^9. No costal fold on fore wing of male.
PROTEIDES, Hübn. Type, *idas*, Cram. (11)
b^8. The apex of fore wing not truncate, outer margin not angled at vein 5.
a^9. Hind tarsi set below with two series of very conspicuous closely set spines.
CHRYSOPLECTRUM, g. n. Type, *otriades*, Hew. (12)
b^9. No conspicuous rows of spines on hind tarsi.
a^{10}. No costal fold on fore wing of male.
a^{11}. Vein 2 of fore wing almost equidistant from 3 and from the base of wing.
HETEROPIA, g. n. Type, *imitatrix*, Mab. (8)
b^{11}. Vein 2 of fore wing twice as far from 3 as from base of wing.
a^{12}. Antennæ: club abruptly robust, crook very slender, considerably shorter than rest of club.
ACOLASTUS, Sc. Type, *savignyi*, Latr. (13)
b^{12}. Antennæ: club very gradually thickened and gradually tapering, crook as long as or longer than the rest of the club.
TELEGONUS, Hübn. Type, *anaphus*, Cram. (14)
b^{10}. Male with a costal fold on fore wing.
a^{11}. Vein 2 of hind wing far before end of cell.
a^{12}. Terminal portion of club of antennæ only slightly or not at all longer than rest of club.
a^{13}. Outer margin of fore wing in male only slightly or not at all longer than inner margin.
a^{14}. Third joint of palpi horizontal.
a^{15}. Vein 3 of hind wing from before end of cell.
a^{16}. Tooth on hind wing very conspicuous.
GONIURUS, Hübn. Type, *cælus*, Cram. (3)
b^{16}. Tooth on hind wing inconspicuous.
THYMELE, Fabr. Type, *mercatus*, Fabr. (15)

b^{13}. Vein 3 of hind wing from end of cell.
TELEMIADES, Hübn. Type, *avitus*, Cram. (16)
b^{14}. Third joint of palpi erect.
DYSCOPHUS, Burm. Type, *sebaldus*, Cram. (17)
b^{12}. Outer margin of fore wing in male very much longer than inner margin.
NASCUS, g. n. Type, *phocus*, Cram. (18)
b^{12}. Terminal portion of club of antennæ more than twice the length of remainder of club.
BUNGALOTIS, g. n. Type, *midas*, Cram. (19)
b^{11}. Vein 2 of hind wing close to end of cell.
DREPHALYS, g. n. Type, *helixus*, Hew. (32)
b^{7}. Male with a tuft of hairs on upperside of hind wing.
a^{8}. Apex of fore wing acute.
a^{9}. Vein 3 of hind wing from before end of cell.
TYPHEDANUS, Butl. Type, *zephus*, Butl. (33)
b^{9}. Vein 3 of hind wing from end of cell.
PORPHYROGENES, g. n. Type, *omphale*, Butl. (35)
b^{8}. Apex of fore wing truncate.
ŒCHYDRUS, g. n. Type, *chersis*, H.-S. (34)
c^{2}. No tail or projecting tooth on hind wing at vein 1 *b*.
a^{3}. Vein 5 of hind wing fully developed.
a^{4}. Male with a costal fold on fore wing.
a^{5}. Hind tibiæ with one pair of spurs.
CASYAPA, Kirby. Type, *corcus*, Feld. (21)
b^{5}. Hind tibiæ with two pairs of spurs.
PTEROXYS, g. n. Type, *phanæus*, Hew. (20)
b^{4}. No costal fold on fore wing of male.
a^{5}. Antennal club very robust.
PHŒNICOPS, g. n. Type, *beata*, Hew. (22)
b^{5}. Antennal club comparatively slender.
a^{6}. Male: outer margin of fore wing longer than inner margin. ..... CAPILA, Moore. Type, *jayadeva*, Moore. (23)
b^{6}. Male: inner margin of fore wing longer than outer margin.
a^{7}. Male with a tuft of hairs on hind tibiæ.
CALLIANA, Moore. Type, *pieridoides*, Moore. (24)
b^{7}. No tuft of hairs on hind tibiæ of the male.
PISOLA, Moore. Type, *zennara*, Moore. (25)
b^{3}. Vein 5 of hind wing wanting (*i. e.* not developed into a tubular vein).
a^{4}. Antennal club more or less hooked.
a^{5}. No tuft of hairs on hind tibiæ of the male.
a^{6}. Vein 3 of hind wing from the end of cell.
CECROPTERUS, H.-S. Type, *zarex*, Hübn. (26)
b^{6}. Vein 3 of hind wing from before end of cell.
a^{7}. Hind wing rounded.
a^{8}. Male with a tuft of radiating hairs on upperside of hind wing. COGIA, Butler. Type, *hassan*, Butl. (27)
b^{8}. No tuft of radiating hairs on upperside of hind wing in the male.
a^{9}. Middle and lower discocellulars of fore wing sub-erect. EPHYRIADES, Hübn. Type, *otreus*, Cram. (28)
b^{9}. Middle and lower discocellulars of fore wing oblique.
a^{10}. Hind wing produced in the subcostal area, distance from origin of vein 8 to extremity of vein 6 greater than the length of vein 1 *b*.
THORYBES, Sc. Type, *bathyllus*, Sm.-Abb. (29)

b^{10}. Hind wing produced in the submedian area. Vein 1 *b* longer than the distance from the origin of vein 8 to the extremity of vein 6.
a^{11}. Male with a costal fold on fore wing.
ACHALARUS, Sc. Type, *lycidas*, Sm.-Abb. (30)
b^{11}. No costal fold on fore wing of male.
RHABDOIDES, Sc. Type, *cellus*, Boisd. (31)
b^7. Hind wing elongate.
MURGARIA, g. n. Type, *albociliatus*, Mab. (39)
b^6. Male with a tuft of hairs on hind tibiæ.
a^8. Vein 3 of hind wing well before end of cell.
ÆTHILLA, Hew. Type, *eleusinia*, Hew. (40)
b^8. Vein 3 of hind wing immediately before end of cell.
HANTANA, Moore. Type, *inferrans*, Feld. (38)
b^4. Club of antennæ sickle-shaped.
a^5. Male with a costal fold on fore wing, and a tuft of hairs near base of hind wing on upperside.
CECINA, Hew. Type, *calathana*, Hew. (36)
b^5. Male with no costal fold on fore wing, but with a tuft of hair at base of abdominal fold on underside of hind wing.
ABLEPSIS, g. n. Type, *vulpinus*, Hübn. (37)
a^1. Antennal club angled, not hooked or sickle-shaped.
ANCISTROCAMPTA, Feld. Type, *hiarbas*, Cram. (41)
b^1. Palpi porrect, divergent; third joint long, slender, naked.
a^2. Outer margin of hind wing crenulated.
HYDRÆNOMIA, Butl. Type, *orcinus*, Feld. (42)
b^2. Outer margin of hind wing even.
a^3. Hind wing much elongated.
PARADROS, g. n. Type, *phœnice*, Hew. (43
b^3. Hind wing not elongated, but with a distinct anal lobe.
a^4. Vein 3 of hind wing from before end of cell.
LIGNYOSTOLA, Mab. Type, *pemphigargyra*, Mab. (44)
b^4. Vein 3 of hind wing from end of cell.
PHANUS, Hübn. Type, *vitreus*, Cram. (45)
b. Hind tibiæ only with terminal pair of spurs.
a^1. Palpi porrect, divergent; third joint long, slender, naked.
a^2. Male with a costal fold on fore wing.
HYALOTHYRUS, Mab. Type, *nitocris*, Cram. (46)
b^2. No costal fold on fore wing of male.
ENTHEUS, Hübn. Type, *peleus*, Linn. (47)
b^1. Palpi, third joint minute, bluntly conical.
a^2. Hind wing not elongated.
CABIRUS, Hübn. Type, *julettus*, Stoll. (48)
b^2. Hind wing very conspicuously elongated.
GRYNOPSIS, g. n. Type, *cæleste*. Westw. (49)

1. Genus POLYTHRIX, nov.

Type, *metallescens*, Mabille.

Neuration and antennæ as in *Eudamus*. Differs in having in the male a tuft of hair at the base of the submedian on the underside of the fore wing, and in the costa of the hind wing being strongly arched at base.

metallescens, Mab. ..... 1.

The characters separating this genus from *Eudamus* being entirely of a sexual character, it would probably be more correct to regard it as a subgenus of *Eudamus*.

South American only.

2. Genus Eudamus. (Plate III. fig. 3.)

Eudamus, Swainson, Ill. ii. p. 48 (1832-33).

Type, *proteus*, Linnæus.

Antennæ: club bent into a hook just beyond the thickest part and tapering to a fine point.

Male with a costal fold except in *eurycles* and *orion*.

Cell of fore wing very long; discocellulars inwardly oblique and in the same straight line, upper discocellulars reduced to a point; vein 9 equidistant from 8 and 10; vein 5 rather nearer to 4 than to 6; vein 2 from near base of wing; vein 3 more than twice as far from 2 as from 4; lower branch of veinlet in cell just before vein 4. Hind wing produced into a tail of varying length; vein 5 wanting; discocellulars hardly traceable; vein 3 just before end of cell; vein 2 nearer to 3 than to 1; vein 7 well before end of cell.

proteus, Linn. ..... 1.
**esmeraldus*, Butl. ..... 2.
santiago, Luc. ..... 3.
**amisus*, Hew. ..... 4.
dorantes, Stoll ..... 5.
**undulatus*, Hew. ..... 6.
**aminias*, Hew. ..... 7.
catillus, Cram. ..... 8.
jethira, Hew. ..... 9.
**albofasciatus*, Hew. ... 10.
zilpa, Butl. .... 11.
**alcæus*, Hew. ..... 12.
simplicius, Stoll ..... 13.
eurycles, Latr. ..... 14.
latipennis, Mab. ..... 15.
carmelita, H.-S. .... 16.
virescens, Mab. ..... 17.
orion, Cram. ..... 18.
brachius, Hübn. ..... 19.
chalco, Hübn. ..... 20.
melophis, Latr. ..... 21.
? *hirtius*, Butl. ..... 22.
**asine*, Hew. ..... 23.
gaana, Mösch. ..... 24.
**auginus*, Hew. ..... 25.
nicasius, Plötz ..... 26.
larius, Plötz ..... 27.
* *corydon*, Butl.
trebia, Mösch. ..... 28.
evenus, Mén. ..... 29.
octomaculata, Sepp ... 30.
calenus, Mab.

And eight unidentified species.

Habitat. Tropical America.

3. Genus Goniurus.

Goniurus, Hübner, Verz. p. 104 (1816). Type, *cælus*, Cramer.

Antennæ: club rather slender, bent into a hook, the terminal portion about as long as rest of club. Palpi: second joint densely scaled; third joint short, porrect, obtusely conical. Fore wing: inner and outer margins subequal; male with a costal fold; cell more than two-thirds the length of costa; discocellulars very oblique, the middle one slightly the longer; vein 3 shortly before the end of cell; vein 2 close to base of wing. Hind wing with a very conspicuous tooth or short tail at vein 1 *b*; vein 7 shortly before the end of cell; discocellulars and vein 5 barely traceable; vein 3 immediately before the end of cell; vein 2 slightly nearer to end of cell than to base of wing. Hind tibiæ fringed, and with two pairs of spurs.

cælus, Cram.
**aurunce*, Hew.

Habitat. South America.

4. Genus PLESTIA. (Plate III. fig. 4.)

Plestia, Mabille, Le Naturaliste, p. 146 (1888).

Type, *staudingeri*, Mab.

Antennæ: club rather flattened, sickle-shaped, the thickening and tapering very gradual, terminating in a fine joint. Fore wing: male with a costal fold; cell more than two thirds length of fore wing; upper discocellular minute; middle and lower discocellulars inwardly oblique, the middle the longer; vein 9 equidistant from 8 and 10; vein 2 from near base of wing; vein 3 about four times as far from 2 as from 4; vein 5 nearer 6 than 4. Hind wing produced into a short tail; vein 5 wanting; discocellulars barely traceable; vein 3 from just before end of cell; vein 2 rather nearer to 3 than to base of wing.

dorus, Edwards ..... 1.

Habitat. The Mexican subregion.

5. Genus TARSOCTENUS, nov. (Plates I. fig. 6; II. fig. 13.)

Type, *plutia*, Hewitson.

Allied to *Phocides*.

Antennæ: club moderate, with a slender terminal hook. Palpi: second joint densely scaled; third joint naked, more prominent than in *Phocides*. Fore wing: male with costal fold; cell considerably more than two-thirds length of costa; discocellulars slightly oblique, middle slightly longer than lower; upper discocellular very short; vein 3 about half as far again from 2 as from 4; vein 2 nearer to base of wing than to vein 3. Hind wing with a distinct lobe at end of vein 1 *b*; vein 7 well before end of cell; discocellulars very faint, slightly outwardly oblique; vein 5 barely traceable; vein 3 rather nearer to end of cell than to vein 2; vein 2 almost equidistant from base of wing and from end of cell. Hind tibiæ in both sexes very short, with only a terminal pair of spurs. In the male one of these spurs is much produced, and the proximal end of the tarsus bears beneath on either side a comb of yellowish bristles which, when the tarsus is straightened out, enclose the lengthened spur. This character is less developed in *papias* than in the other species of the genus.

* *plutia*, Hew. ..... 1.
corytas, Cram..... 2.
pyramus, Cram.
* *præcia*, Hew. ..... 3.
* *papias*, Hew. ..... 4.

One species, *gaudialis*, Hew., also belongs to this genus, but it is not in the British Museum.

Confined to tropical America.

6. Genus PHOCIDES. (Plates I. fig. 5; III. fig. 2.)

Phocides, Hübn Verz. p. 103 (1816). Type, *palemon*, Cramer.
Erycides, Hübn. Verz. p. 110 (1816). Type, *pigmalion*, Cramer.
Dysenius, Sc. Syst. Rev. p. 46 (1872). Type, *albicilla*, H.-S.

Antennæ: club rather robust, extremity very fine, forming a hook

with remainder of club. Palpi well separated, thickly scaled, forming two square projections in front of the face; third joint hardly visible. Fore wing: male with a costal fold; cell more than two-thirds length of costa; discocellulars very oblique, middle one straight, lower strongly arched and much the longer; vein 3 just before end of cell; vein 2 about twice as far from 3 as from base of wing. Hind wing much elongated; vein 3 immediately before end of cell; vein 5 wanting. Hind tibiæ with two pairs of spurs.

This genus is readily recognized by the unique character of the lower discocellular of the fore wing.

pigmalion, Cram. ..... 1.
batabano, Luc. ..... 2.
* *urania*, Westw. ..... 3.
* *pialia*, Hew. ..... 4.
* *charonotis*, Hew. ..... 5.
* *oreades*, Hew. ..... 6.
yokhara, Butl. ..... 7.
lilia, Reak. ..... 8.
socius, Butl.
albicilla, H.-S.
palemon, Cram. ..... 9.
cruentus, Hübn.

Found throughout tropical America.

7. Genus Hypocryptothrix, nov.

Type, *teutas*, Hew.

Antennæ: club moderately robust, bent into a hook. Fore wing: male with a costal fold; cell slightly more than two-thirds length of costa; upper discocellular very short, lower and middle discocellulars inwardly oblique, subequal; veinlet in cell at vein 4; vein 3 close to end of cell, about four times as far from 2 as from 4. Hind wing slightly lobate; vein 8 arched at base, then bent abruptly, situated for its terminal three fourths, and approaching very close to vein 7; vein 7 from close to the base of wing; discocellulars very faint, strongly outwardly oblique; vein 5 wanting; vein 3 from end of cell; vein 2 nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs.

Male with a tuft of hair on underside of fore wing at base of submedian. Allied to *Tarsoctenus*.

* *teutas*, Hew. ..... 1.

Confined to tropical South America.

8. Genus Heteropia.

Heteropia, Mabille, Le Naturaliste, p. 68 (1889).

Type, *imitatrix*, Mabille.

Antennæ: club moderate, gradually thickened and gradually tapering to a fine point, bent into a hook. Palpi as in *Thymele*. Fore wing: cell just two-thirds length of costa; veinlet in cell at vein 4; no costal fold in male; upper discocellular very short, middle and lower discocellulars inwardly oblique, subequal; vein 3 close to end of cell, twice as far from 2 as from 4; vein 2 well removed from base of wing, only slightly nearer to base than to vein 3. Hind wing slightly angled at vein 1 *b*; cell moderate, vein 7 more than twice as far from base as from end of cell; vein 3 from end of

cell; vein 2 slightly nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs.

{ *imalena*, Butl. ..... 1.
{ *imitatrix*, Mab.
* *bryaxis*, Hew. ..... 2.

And two unidentified species.

Confined to Central and South America.

9. Genus Spathilepia.

Spathilepia, Butler, Ent. Mon. Mag. vii. p. 57 (1870).
Type, *clonius*, Cramer.

Antennæ: club moderate, very gradually thickened, bent into a hook, the terminal portion not quite as long as rest of club. Palpi porrect, second joint densely scaled, third joint short. Fore wing: outer margin longer than inner margin; outer margin angled at vein 5, the upper portion almost at right angles to costa, the lower portion running obliquely to outer angle; male with a costal fold; cell more than two-thirds the length of costa; vein 12 reaching costa before end of cell; upper discocellular minute; middle and lower discocellulars inwardly oblique, the middle one about twice as long as lower one; vein 3 three times as far from base as from end of cell; vein 2 three times as far from end of cell as from base of wing. Hind wing toothed at vein 1 *b*; vein 7 three times as far from 8 as from 6; discocellulars faint, almost erect; vein 5 wanting; vein 3 just before end of cell; vein 2 slightly nearer to end of cell than to base of wing. Hind tibiæ thickly fringed and with two pairs of spurs.

clonius, Cram. ..... 1.

Inhabits Central and South America.

10. Genus Epargyreus. (Plate I. fig. 4.)

Epargyreus, Hübner, Verz. p. 105 (1816). Type, *tityrus*, Fabr.
Epargyreus, Scudder, Butt. N. Engl. vol. ii. p. 1399 (1889).
Type, *tityrus*, Fabr.

Antennæ: rather more robust than in *Thymele*, otherwise very similar. Palpi densely scaled, third joint almost entirely concealed by the scales of the second joint. Fore wing: male with a costal fold; cell more than two-thirds length of costa; veinlet in cell from just behind vein 3; vein 12 reaching costa well before end of cell; upper discocellular minute, middle and lower discocellulars inwardly oblique and in the same straight line; vein 3 less than twice as far from 2 as from end of cell; vein 2 more than twice as far from 3 as from base of wing. Hind wing prominently toothed at vein 1 *b*; vein 7 more than twice as far from base of wing as from end of cell; discocellulars hardly traceable, slightly outwardly oblique; vein 5 wanting; vein 3 well before end of cell, about twice as far from 2 as from 4; vein 2 slightly further from end of cell than from base of wing. Hind tibiæ with two pairs of spurs.

This genus is closely allied to *Proteides*, from which it differs

chiefly in the less truncate apex to the fore wing, and the slightly different relative positions of the median branches. The male also is provided with a costal fold, which is wanting in *Proteides*.

tityrus, Fabr. / *clarus*, Cram. ..... 1.
pseudexadeus, Westw. ... 2.
socus, Hübn. ..... 3.
* *barisses*, Hew. ..... 4.
* *antæus*, Hew. ..... 5.
exadeus, Cram. ..... 6.
* *asander*, Hew. ..... 7.
* *cnispe*, Hew. ..... 8.
zestos, Hübn. ..... 9.
talus, Cram. ..... 10.

And two unidentified species.
American and West Indian.

11. Genus Proteides.

Proteides, Hübner, Verz. p. 105 (1816). Type, *idas*, Cramer.
Dicranaspis, Mabille, Ann. Soc. Ent. Belge, xxi. p. 24 (1878). Type, *idas*, Cramer.

Antennæ: club abruptly thickened, very robust, bent into a hook, terminal portion short and gradually tapering. Fore wing: no costal fold in male; cell very long, almost three-fourths length of costa; vein 12 reaching costa before the end of cell; vein 10 nearer to 9 than to 11; vein 9 nearer to 8 than to 10; upper discocellular minute, middle and lower discocellulars inwardly oblique; vein 5 considerably nearer to 4 than to 6; vein 3 slightly nearer to end of cell than to vein 2; vein 2 less than twice as far from vein 3 as from base of wing. Fore wing much produced at apex, costa about one and a half times the length of inner margin; outer margin at almost a right angle with costa from apex to vein 5, then very oblique to outer angle. Hind wing prominently toothed at submedian; cell moderate; vein 7 well before end of cell; discocellulars very faint; vein 5 wanting; vein 3 well before end of cell; vein 2 nearer to end of cell than to base of wing, and twice as far from 3 as 3 is from 4. Hind tibiæ with two pairs of spurs.

idas, Cramer ..... 1.

And two unidentified species.
Confined to tropical America and the West Indies.

12. Genus Chrysoplectrum, nov. (Plate II. fig. 15.)

Type, *otriades*, Hewitson.

Antennæ: club moderate, bent into a hook, terminal portion very slender, rather more than half as long as remainder of club. Terminal joint of palpi minute, obtusely conical. Fore wing: outer margin considerably longer than inner margin; male with a costal fold; cell scarcely two-thirds length of costa; vein 12 reaching costa before the end of cell; upper discocellular minute, middle discocellular inwardly oblique, lower almost erect, the middle one the longer; vein 3 more than three times as far from base of wing as from end of cell, twice as far from vein 2 as from 4; veinlet in cell from just before vein 4. Hind wing strongly arched at base, rather

elongated; outer margin almost straight in male, slightly more convex in female; a tooth-like lobe at anal angle; vein 7 more than twice as far from 8 as from 6; discocellulars erect; vein 3 from end of cell; vein 2 twice as far from base of wing as from end of cell. Hind tibiæ with a long fringe and two pairs of spurs, the terminal pair very long. On the hind tarsi of the male below there are two series of densely set golden spines.

**otriades*, Hew. ..... 1.

And two unnamed species.

Confined to South America.

13. Genus Acolastus.

Polygonus, Hübner, Exot. Schmett. ii. (1822).

Type, *amyntas*, Fabr. (nom. præocc.).

Acolastus, Scudder, Syst. Rev. p. 50 (1872). Type, *savignyi*, Latr.

Antennæ: club moderate, bent into a hook, terminal portion very slender, rather more than half as long as remainder of club; terminal joint of palpi minute, conical. Fore wing: outer and inner margins subequal, no costal fold in male; cell considerably more than two-thirds length of costa; upper discocellular short; middle and lower discocellulars subequal, inwardly oblique, and in the same straight line; vein 12 reaching costa well before the end of cell; vein 3 remote from end of cell, twice as far from base of wing as from end of cell; vein 2 more than twice as far from end of cell as from base of wing; veinlet beyond vein 3, median slightly angled where it meets it. Hind wing: costa strongly arched at base, outer margin rounded, a conspicuous tooth-like lobe at anal angle; vein 7 twice as far from 8 as from 6; discocellulars almost erect; vein 5 wanting; veins 3 and 2 both from shortly before end of cell; vein 3 nearer to 4 than to 2; vein 2 considerably further from base of wing than from end of cell. Hind tibiæ fringed, and with two pairs of spurs.

amyntas, Fabr.
lividus, Hübn.
savignyi, Latr. ..... 1.

This genus appears to be closely allied to *Proteides*.

Habitat. South America and West Indies.

14. Genus Telegonus.

Telegonus, Hübner, Verz. bek. Schmett. p. 104 (1816).

Type, *anaphus*, Cramer.

Antennæ: thickening of club slight and very gradual; club bent usually at about a right angle, occasionally to less, the terminal portion about as long as rest of club. Palpi: second joint densely scaled, third joint minute. Fore wing: outer margin much longer than inner margin; cell just over two-thirds the length of costa; no costal fold in male; vein 12 reaching costa well before the end of

cell; upper discocellular minute, middle and lower discocellulars oblique in the same straight line, the upper slightly the longer; vein 3 rather more than twice as far from base of wing as from end of cell; vein 2 about three times as far from end of cell as from base of wing; veinlet in cell shortly before vein 4. Hind wing produced into a lobe at anal angle, outer margin evenly rounded; vein 7 well before end of cell, slightly nearer to 6 than to 8; discocellulars very faint, almost erect; vein 5 wanting; vein 3 just before end of cell; vein 2 rather nearer to end of cell than to base of wing. Hind tibiæ fringed, and with two pairs of spurs.

Closely allied to *Thymele*, differs from it slightly in neuration and in the absence of the costal fold on the fore wing of the male.

apastus, Cram. ..... 1.
anaphus, Cram. ..... 2.
alardus, Stoll ..... 3.
habana, Luc. ..... 4.
* *clorus*, Hew. ..... 5.
cretens, Cram. ..... 6.
parmenides, Cram.
* *meretrix*, Hew. ..... 7.
* *centrites*, Hew. ..... 8.

And four unidentified species.

Confined to tropical America.

15. Genus Thymele.

Thymele, Fabr. Ill. Mag. vi. p. 287 (1807). Type, *mercatus*, Fabr.
Astraptes, Hübner, Verz. p. 103 (1816). Type, *aulestes*, Cramer.
Euthymele, Mabille, Ann. Soc. Ent. Belge, xxi. p. 24 (1878). Type not specified.

Antennæ; club slender, gradually thickened and gradually tapering to a fine point, abruptly bent into a hook just beyond its thickest portion. Palpi well separated, third joint minute. Fore wing: male with a costal fold; cell two-thirds length of costa; veinlet in cell just before vein 4; vein 12 reaching costa well before end of cell; upper discocellular minute, lower and middle discocellulars subequal, inwardly oblique, and in the same straight line; vein 3 rather more than twice as far from 2 as from end of cell; vein 2 about one and a half times as far from 3 as from base of wing. Hind wing much produced in submedian area and slightly toothed at submedian nervule; cell short, not reaching half across wing; vein 4 much longer than the lower margin of the cell; vein 7 rather nearer to end of cell than to base of wing; discocellulars barely traceable, almost erect; vein 5 wanting; vein 3 from immediately before end of cell; vein 2 nearer to end of cell than to base of wing. Hind tibiæ thickly fringed and with two pairs of spurs.

Of the four species included by M. Mabille in his genus *Euthymele*, two belong to *Thymele* and two to *Telegonus*.

fulgerator, Walch. ..... 1.
mercatus, Fabr.
* *naxos*, Hew. ..... 2.
aulestes, Cram. ..... 3.
colossus, H.-S. ..... 4.
egregius, Butl. ..... 5.
enotrus, Cram. ..... 6.
* *halesius*, Hew. ..... 7.

Confined to tropical America.

16. Genus Telemiades.

Telemiades, Hübner, Verz. p. 106 (1816). Type, *avitus*, Cramer.

Antennæ: club moderate, strongly hooked, terminal portion very slender and slightly shorter than remainder of the club. Palpi: second joint densely scaled, third joint short and obtuse. Fore wing: inner and outer margins subequal; male with a costal fold; cell two-thirds length of costa; vein 12 reaching costa before end of cell; upper discocellular minute; middle and lower discocellular inwardly oblique, the lower the longer; vein 3 close to end of cell, three times as far from base of wing as from end of cell; vein 2 nearer to base of wing than to vein 3. Hind wing evenly rounded, rather produced at anal angle; vein 7 about three times as far from base of wing as from end of cell; discocellulars and vein 5 barely traceable; vein 3 from end of cell; vein 2 about twice as far from base of wing as from end of cell. Hind tibiæ with two pairs of spurs, upper pair minute.

avitus, Cramer ..... 1.
**phasias*, Hew. ..... 2.
**penidas*, Hew. ..... 3.
**uzines*, Hew. ..... 4.
amphion, Hübn. ..... 5.

Confined to South America.

17. Genus Dyscophus. (Plate III. fig. 8.)

Dyscophus, Burmeister, Descr. Rep. Arg. v. p. 291 (1878). Type, *sebaldus*, Cramer.

Antennæ: club moderate, hooked, terminal portion very fine, as long as rest of club. Fore wing: male with a costal fold; cell more than two-thirds length of costa; outer margin longer than inner margin; outer end of cell oval; upper discocellular short but distinct, outwardly oblique; middle discocellular erect; lower discocellular inwardly oblique, longer than the middle one; veinlet just before vein 4; vein 4 opposite vein 8; vein 12 reaching costa before end of cell; vein 3 about half as far again from 2 as from 4; vein 2 nearer to base of wing than to vein 3. Hind wing produced in submedian area; outer margin angled at vein 2 and again at vein 1 *b*; vein 7 well before end of cell, more than twice as far from vein 8 as from 6; upper discocellular straight, lower slightly outwardly oblique; vein 5 wanting; vein 3 just before end of cell; vein 2 more than twice as far from base of wing as from end of cell. Hind tibiæ densely fringed and with two pairs of spurs.

sebaldus, Cram. ..... 1.
crameri, Latr.
**doriscus*, Hew. ..... 2.
cæcutiens, H.-S.

Confined to South America.

18. Genus Nascus, nov.

Type, *phocus*, Cramer.

Antennæ: club rather robust, bent into a hook, terminal portion very slender and rather longer than rest of club. Palpi upturned, third joint almost concealed. Fore wing: outer margin very much longer than inner margin, the apex being very conspicuously produced; cell more than two-thirds the length of costa; male with a costal fold; discocellulars very oblique, the lower one slightly the longer; vein 3 shortly before end of cell; vein 2 close to base of wing. Hind wing anally produced, and with an inconspicuous tooth at vein 1 *b*; vein 7 close to end of cell; discocellulars and vein 5 barely traceable; vein 3 immediately before the end of the cell; vein 2 considerably nearer to end of cell than to base of wing. Hind tibiæ with a long fringe of coarse hairs and with two pairs of spurs.

phocus, Cram. ♂ ..... 1.
**pherenice*, Hew. ♀.
broteas, Cram. ♀..... 2.
evribates, Cram. ♀ ..... 3.
nicias, Fabr. ♂.
**hesus*, Westw. ♂.
**etias*, Hew. ♀.
**eriopis*, Hew. ♂ ..... 4.
cæpio, H.-S. ♂♀..... 5.
cephise, H.-S. ♂♀ ..... 6.

And three unidentified species.

Confined to South America.

19. Genus Bungalotis, nov. (Plate III. fig. 7.)

Type, *midas*, Cramer.

Antennæ: club very gradually thickened and tapering to a fine point, bent at about a right angle; terminal portion very long, about twice as long as remainder of club, and about one-fourth of the whole antenna. Palpi: third joint entirely concealed by the scales of the second joint. Fore wing: inner margin longer than outer margin, cell more than two-thirds the length of costa; male with a very prominent costal fold; discocellulars almost erect, subequal; vein 3 more than three times as far from base of wing as from end of cell; vein 2 less than three times as far from end of cell as from base of wing. Hind wing produced at anal angle, but with no conspicuous lobe; vein 7 well before end of cell, less than twice as far from 8 as from 6; discocellulars slightly outwardly oblique; vein 3 before end of cell; vein 2 twice as far from 3 as 3 is from 4, and twice as far from base of wing as from 3. Hind tibiæ with a rather long fringe and two pairs of spurs. The costa of the hind wing in the male of the type species is black with bluish reflections, a character which is probably sexual.

midas, Cramer. ♂ ..... 1.
astylos, Cramer. ♀..... 2.
**phaselis*, Hew. ♂♀..... 3.
poligius, Latr. ♀ ..... 4.
ramusis, Cramer. ♀ ... 5.
**astrapæus*, Hew. ♀.
erythus, Cramer. ♀..... 6.
**nicephorus*, Hew. ♂ ... 7.
sebrus, Feld. ♂ ..... 8.
**peligrus*, Hew. ♂.
**gonatus*, Hew. ♀.
heras, Mab. ♂♀..... 9.

Confined to South America.

20. Genus Pteroxys, nov.

Type, *phanæus*, Hewitson.

Antennæ: club short, rather abruptly thickened and tapering to a fine point, bent at about a right angle at its thickest part, the terminal portion longer than the rest of the club; second joint of palpi densely scaled; the third joint almost entirely concealed. Fore wing: inner and outer margins subequal; male with a costal fold; cell of fore wing three-fifths length of fore wing; vein 12 reaching costa just before end of cell; vein 6 well below end of cell; upper discocellular short but distinct; middle and lower discocellulars slightly oblique, the lower rather the longer; vein 3 shortly before end of cell, about four times as far from vein 4 as from base of wing; vein 2 less than twice as far from end of cell as from base of wing. Hind wing: vein 7 about three times as far from base of wing as from end of cell; middle discocellular erect, lower outwardly concave, the lower much the longer; vein 5 from their angle; vein 3 from end of cell; vein 2 twice as far from base as from end of cell; outer margin even, lobe inconspicuous. Hind tibiæ with two pairs of spurs and a long tuft of hair from proximal end.

**phanæus*, Hew. ..... 1.
**lidderdali*, Elwes ..... 2.

Confined to the Oriental region.

21. Genus Casyapa.

Casypa, Kirby, Syn. Cat. Diurn. Lep. p. 576 (1871).
Type, *corvus*, Felder.

Chætocneme, Felder, Sitzb. Ak. Wiss., math.-nat. Cl. vol. xl. p. 460 (1860) (nom. præocc.).

Antennæ long: club moderate, gradually thickened, tapering to a fine point; terminal portion bent but not hooked. Fore wing: male with a costal fold; inner and outer margins subequal; cell just two-thirds the length of costa; vein 12 reaching costa before the end of cell; vein 8 from upper angle of cell; vein 7 below angle; upper discocellular short, distinct, almost erect; middle and lower discocellulars subequal, erect, and in the same straight line; vein 5 equidistant from 4 and 6; vein 3 well before end of cell, rather more than twice as far from base of wing as from end of cell; vein 2 three times as far from end of cell as from base of wing. Hind wing evenly rounded, not produced into a lobe; cell long, extending more than half across wing; vein 7 shortly before end of cell, three times as far from 8 as from 6; discocellulars faint, nearly erect; vein 5 wanting; vein 3 just before end of cell; vein 2 three times as far from base of wing as from end of cell. Hind tibiæ densely fringed and with only the terminal pair of spurs.

corvus, Felder ..... 1.
critomedia, Guér. ..... 2.
odix, Boisd.
**caristus*, Hew.

Confined to the East Indies.

22. Genus PHŒNICOPS, nov. (Plate III. fig. 6.)

Type, *beata*, Hew.

Antennæ: club moderate, gradually thickened and gradually tapering to a point, bent into a crescent, and not abruptly angled. Palpi porrect; third joint minute, entirely concealed by scales of second joint. Fore wing: outer margin longer than inner margin, and more or less angled at vein 5; no costal fold on fore wing in male; cell two-thirds length of costa; upper discocellular short, middle discocellular almost erect, lower more oblique and slightly longer; veinlet in cell from just above vein 4; vein 3 close to end of cell, quite five times as far from base of wing as from end of cell; vein 2 rather more than twice as far from end of cell as from base of wing. Hind wing: no anal lobe, outer margin more or less angled at vein 3; vein 7 more than twice as far from 8 as from 6; upper discocellular short, erect, lower longer, outwardly concave; vein 5 present; veinlet in cell clearly traceable, the two branches meeting the upper and lower discocellulars respectively; vein 3 just before end of cell; vein 2 almost three times as far from base of wing as from end of cell. Hind tibiæ with only the terminal pair of spurs, and in the male with a complete fringe of very long hairs.

**beata*, How. ..... 1.
**denitza*, Hew. ..... 2.

Confined to the Australian region.

23. Genus CAPILA.

Capila, Moore, P. Z. S. 1865, p. 785. Type, *jayadeva*, Moore.

Antennæ: club only slightly thicker than shaft, very gradually thickening and as gradually tapering to a fine point, evenly curved into a hook. Palpi: second joint clothed with longish hairs; third joint short, porrect. Fore wing: no costal fold in male; cell three-fifths of costa; outer margin longer than inner margin; vein 12 reaching costa opposite end of cell; vein 11 nearly opposite vein 3; vein 10 equidistant from 9 and 11; end of cell broadly truncate; upper discocellular minute, middle and lower discocellulars almost erect and in the same straight line, the lower the longer; veinlet beyond vein 4; vein 3 about twice as far from 2 as from end of cell; vein 2 slightly nearer to base of wing than to vein 3. Hind wing evenly rounded; vein 7 shortly before end of cell; middle discocellular almost erect, lower angled, the upper part inwardly oblique, the lower part outwardly oblique; vein 5 well developed; vein 3 just before end of cell; vein 2 close to end of cell, more than three times as far from base of wing as from end of cell. Hind tibiæ with two pairs of spurs, and with a tuft of hairs longer than the tibia attached to it near its proximal end.

Closely allied to *Pisola*.

**jayadeva*, Moore ..... 1.

Confined to the Indian subregion.

24. Genus Calliana.

Calliana, Moore, P. Z. S. 1878, p. 686. Type, *pieridoides*, Moore.

[Antennæ wanting.]

Palpi almost erect, second joint thickly scaled, third joint minute. Fore wing: inner margin longer than outer margin; no costal fold in male; vein 12 reaching costa opposite end of cell; cell two-thirds length of costa; upper angle of cell rounded; upper discocellular short, outwardly oblique; middle and lower discocellulars almost erect, the lower the longer; vein 3 about twice as far from 2 as from end of cell; vein 2 slightly nearer to base of wing than to 3; veinlet in cell at just before vein 4. Hind wing evenly rounded; cell moderate, about half the length of costa; vein 7 shortly before end of cell, more than four times as far from base as from end of cell; middle discocellulars slightly outwardly oblique, lower slightly inwardly oblique, the lower about half as long again as the middle one; vein 5 well developed, much nearer to 6 than to 4; vein 3 just before end of cell; vein 2 more than twice as far from base as from end of cell. Hind tibiæ with two pairs of spurs, and also with a tuft of hair longer than the tibia attached to it near its proximal end.

The sole species of this genus is *pieridoides*, Moore, which is not in the British Museum. The above diagnosis is from the type specimen kindly lent me for that purpose by Mr. Moore.

Confined to the Oriental region.

25. Genus Pisola.

Pisola, Moore, P. Z. S. 1865, p. 785. Type, *zennara*, Moore.

Antennæ and palpi much as in *Capila*. Fore wing: inner margin considerably longer than outer margin; neuration as in *Calliana*, from which it differs only in having no tuft on the hind tibiæ in the male.

zennara, Moore ..... 1.
cerinthus, Felder ..... 2.

Confined to Asia.

26. Genus Cecropterus.

Cecropterus, Herr.-Schäff. Prodr. Syst. Lep. iii. p. 45 (1869). Type, *zarex*, Hübn.

Antennæ: club moderate, bent into a hook, the terminal portion equal to remainder of club. Palpi porrect, second joint densely scaled, third joint small. Fore wing: outer margin longer than inner margin; no costal fold in male; cell long, more than two-thirds length of fore wing; vein 12 reaching costa before end of cell; upper discocellular minute, middle discocellular inwardly oblique, lower more erect; vein 5 nearer to 4 than to 6; vein 3 more than four times as far from base of wing as from end of cell; vein 2 twice as far from end of cell as from base of wing. Hind wing much produced in submedian area, but with no distinct lobe

or tail; vein 7 more than twice as far from 8 as from 6; discocellulars very faint, outwardly concave; vein 5 wanting; vein 3 at end of cell; vein 2 less than twice as far from base of wing as from end of cell, nearer to base of wing than vein 7. Hind tibiæ fringed and with two pairs of spurs.

carex, Hübn. ..... 1.
**annus*, Fabr. ..... 2.
bipunctatus, Gmel. ..... 3.
itylus, Hübn. ..... 4.
neis, Hübn. ..... 5.
cincta, H.-S. ..... 6.
**phrynicus*, Hew. ..... 7.

And three unidentified species.

27. Genus Cogia.

Cogia, Butler, Trans. Ent. Soc. Lond. p. 508 (1870).

Type, *hassan*, Butler.

Antennæ: club moderate, bent at about a right angle, tapering to a fine point. Third joint of palpi slightly projecting from the clothing of second joint. Fore wing: outer margin longer than inner margin; no costal fold in male; cell more than three-fifths the length of costa; vein 12 reaching costa before the end of the cell; middle and lower discocellulars inwardly oblique and in the same straight line, the middle the longer; vein 3 twice as far from 2 as from end of cell; vein 2 more than twice as far from end of cell as from base of wing. Hind wing: vein 7 only slightly further from base of wing than from end of cell; discocellulars erect, faint; vein 5 barely traceable; vein 3 just before end of cell; vein 2 rather nearer to end of cell than to base of wing.

Male with an erectile tuft of hairs on upperside of hind wing, attached immediately below the origin of the median nervule.

hassan, Butl. ..... 1.
calchas, H.-S. ..... 2.
terranea, Butl.

And one unidentified species.

Confined to tropical America.

28. Genus Ephyriades.

Ephyriades, Hübn. Verz. p. 111 (1816). Type, *otreus*, Cramer.
Oileides, Hübn. Exot. Schmett. ii. (1822–26).

Type, *zephodes*, Hübn.

Antennæ as in *Cogia*. Palpi more widely separated, porrect; third joint rather conspicuous. Fore wing: inner and outer margins subequal, or the inner slightly the longer; no costal fold in male; cell just over two-thirds the length of costa; vein 12 reaching costa almost opposite to the end of cell; middle and lower discocellulars almost erect, subequal; vein 5 slightly nearer to 6 than to 4; vein 3 very shortly before end of cell, more than three times as far from 2 as from 4; vein 2 more than twice as far from base of wing as from end of cell. Hind wing: vein 7 close to end of cell, remote from base of wing; discocellulars faint; vein 5 barely

traceable; vein 3 immediately before end of cell; vein 2 considerably nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs.

Male with the abdominal fold clothed with long hair-like scales.

{ *otreus*, Cram. ..... 1.
{ *clericus*, Fabr.
{ *zephodes*, Hübn.
pekahia, Hew. ... 2.

And five unidentified species.

Confined to tropical America.

29. Genus Thorybes.

Thorybes, Scudder, Syst. Rev. Am. Butt. p. 50 (1872).
Type, *bathyllus*, Smith-Abb.

Thorybes, Scudder, Butt. East. Un. States, vol. ii. p. 1423 (1889).

Lintneria, Butler, Trans. Ent. Soc. p. 57 (1877) (nom. præocc.).
Type, *daunus*, Cramer.

Antennæ and palpi as in *Achalarus*. Fore wing: inner and outer margins subequal; cell more than two-thirds length of fore wing; vein 12 reaching costa before end of cell; upper discocellular minute, middle and lower discocellulars inwardly oblique and in the same straight line, the lower the longer; vein 3 more than three times as far from base of wing as from end of cell; vein 2 about three times as far from end of cell as from base of wing; veinlet in cell at vein 4. Hind wing: vein 7 about twice as far from 8 as from 6; discocellulars faint, slightly concave outwardly; vein 3 from end of cell; vein 2 rather nearer to end of cell than to base of wing, nearer to base of wing than vein 7; outer margin evenly rounded, slightly angled at vein 1 *b*. Hind tibiæ with two pairs of spurs.

In this genus the type species, *bathyllus*, is without a costal fold in the male, while the second species, *pylades*, is provided with a fold.

{ *daunus*, Cram. ..... 1.
{ *bathyllus*, Sm.-Abb.
pylades, Sc. ..... 2.

Confined to America.

30. Genus Achalarus.

Achalarus, Scudder, Syst. Rev. Am. Butt. p. 50 (1872).
Type, *lycidas*, Smith-Abb.

Achalarus, Scudder, Butt. East. Un. States, vol. ii. p. 1412 (1889).

Lobocla, Moore, Journ. As. Soc. Beng. vol. liii. pt. 2, p. 51 (1884).
Type, *liliana*, Atkinson.

Antennæ: club moderate, bent into a hook, the terminal portion about as long as rest of club. Palpi porrect, second joint densely scaled, third joint short. Fore wing: inner and outer margins subequal; vein 12 reaching costa before end of cell; male with a costal fold; cell long, more than two-thirds length of costa; upper discocellular minute, middle and lower discocellulars inwardly oblique in

the same straight line, the lower the longer; veinlet at vein 4; vein 3 more than four times as far from base of wing as from end of cell; vein 2 about three times as far from end of cell as from base of wing. Hind wing slightly lobed at anal angle; discocellulars faint, erect; vein 5 present, but very faint; vein 7 three times as far from 8 as from 6; vein 3 just before end of cell; vein 2 almost twice as far from base of wing as from end of cell. Hind tibiæ with two pairs of spurs.

lycidas, Sm.-Abb. ..... 1.
liliana, Moore ..... 2.
casyapa, Moore ..... 3.
bifasciata, Brem. ..... 4.

American and Asian.

31. Genus Rhabdoides.

Rhabdoides, Scudder, Butt. East. Un. States, vol. iii. p. 1854 (1889).
Type, *cellus*, Boisduval.

Antennæ, palpi, neuration, and legs as in *Achalarus*, from which it differs only in the absence of the costal fold in the male.

cellus, Boisd.

And one unidentified species.
Confined to America.

32. Genus Drephalys, nov.

Type, *helixus*, Hew.

Antennæ and palpi as in *Typhedanus*. Fore wing: outer margin slightly longer than inner margin; male with a costal fold; cell of fore wing more than three-fifths the length of costa; vein 12 reaching costa almost opposite end of cell; discocellulars nearly erect; vein 3 well before end of cell, considerably nearer to 4 than to 2; vein 2 close to base of wing, about three times as far from end of cell as from base of wing. Hind wing much produced, but not to a point. Neuration as in *Typhedanus*.

* *helixus*, Hew.

33. Genus Typhedanus.

Typhedanus, Butler, Trans. Ent. Soc. Lond. p. 497 (1870).
Type, *zephus*, Butler.

Antennæ: club moderate, bent into a hook, the terminal portion very slender, about half the length of remainder of club. Palpi: third joint minute, hardly projecting from clothing of second joint. Fore wing much produced apically, outer margin considerably longer than inner margin; cell of fore wing more than two-thirds the length of costa; no costal fold in male; vein 12 reaching costa well before the end of cell; discocellulars inwardly oblique, subequal; vein 5 nearer to 6 than to 4; vein 3 shortly before the end of cell, about twice as far from 2 as from 4; vein 2 twice as far from end of cell as from base of wing. Hind wing produced to a point at the anal angle; outer margin very oblique, slightly concave; vein 7

well before end of cell, almost equidistant from veins 8 and 6; disco-cellulars and vein 5 barely traceable; vein 3 well before end of cell, equidistant from 2 and 4; vein 2 considerably nearer to end of cell than to base of wing. Male with a tuft of long recumbent hairs lying along the outer edge of the abdominal fold on the upperside of the hind wing and attached along vein 1 *b* near its origin. Hind tibiæ with two pairs of spurs.

zephus, Butler.

Inhabits tropical South America.

34. Genus Œchydrus, nov.

Type, *chersis*, H.-S.

Antennæ: club rather robust, bent into a hook. Palpi porrect: second joint long, densely clothed; third joint short, obtusely conical, almost concealed. Fore wing: apex very truncate, much as in *Spathilepia*; outer margin considerably longer than inner margin; cell two-thirds the length of costa; vein 12 reaching costa almost opposite the end of cell; discocellulars slightly inwardly oblique; vein 5 nearer to 6 than to 4; vein 3 immediately before the end of cell: vein 2 twice as far from end of cell as from base of wing. Hind wing much produced; vein 7 well before end of cell; disco-cellulars distinct: vein 5 very faint; vein 3 immediately before the end of cell; vein 2 about three times as far from base of wing as from end of cell. Hind tibiæ fringed and with two pairs of spurs.

Male with an erectile tuft of hairs at base of abdominal folds, much as in *Cogia*.

chersis, H.-S. ... 1.
cevelinda, Butler.
* *azinis*, Hew. ..... 2.

Confined to tropical America.

35. Genus Porphyrogenes, nov.

Type, *omphale*, Butler.

Antennæ: club very slender, sickle-shaped, terminating in a fine point. Palpi: third joint bluntly conical, slightly projecting from the clothing of the second joint. Fore wing: inner and outer margins subequal; male with a costal fold; vein 12 reaching costa well before the end of cell; cell very long, almost three quarters the length of costa; discocellulars inwardly oblique, the middle slightly the longer; lower margin of cell between veins 3 and 4 arched upwards; vein 3 well before the end of the cell, only slightly farther from 2 than from 4; vein 2 slightly nearer to base of wing than to vein 3. Hind wing: vein 7 shortly before end of cell; disco-cellulars and vein 5 barely traceable; vein 3 from end of cell; vein 2 more than twice as far from base of wing as from end of cell. Hind tibiæ fringed and with two pairs of spurs.

In the male the inner margin of the fore wing is strongly arched; there is a tuft of short hairs on a silvery patch on the upperside of the hind wing at the origin of vein 8, there being a corresponding

silvery patch on the underside of the fore wing, and the abdominal fold of the hind wing is densely clothed with long hair-like scales.

omphale, Butler ..... 1. | **pausias*, Hew. ..... 2.

Confined to South America.

36. Genus Cæcina.

Cæcina, Hewitson, Desc. Hesp. p. 55 (1868).

Type, *calathana*, Hewitson.

Antennæ: club moderate, gradually thickening and gradually tapering to a point, evenly curved, not abruptly bent. Palpi: second joint densely scaled; third joint short, porrect, bluntly pointed. Fore wing: inner margin sinuate, rather longer than outer margin; cell two-thirds the length of costa; vein 12 reaching costa before end of cell; upper discocellular very short; middle and lower discocellulars subequal, inwardly oblique in the same straight line; vein 3 more than three times as far from base of wing as from end of cell; vein 2 about twice as far from end of cell as from base of wing. Hind wing: lobe inconspicuous; vein 7 very shortly before end of cell; discocellulars faint, outwardly oblique; vein 5 wanting; vein 3 just before end of cell; vein 2 hardly twice as far from base of wing as from end of cell. Hind tibiæ almost naked, with two pairs of spurs.

The male has a patch of hairs on the upperside of the hind wing, extending along the upper edge of the subcostal vein from the divarication of the costal to the forking of the subcostal branch, the hairs being flattened on the wing and pointing towards the costa.

**calathana*, Hew. ..... 1. | **compusa*, Hew. ..... 2.

Confined to tropical America.

37. Genus Ablepsis, nov.

Type, *vulpinus*, Hübn.

Antennæ: club moderate, rather flattened, sickle-shaped. Palpi suberect; second joint pressed close against face, third joint minute. Fore wing: inner and outer margins subequal; no costal fold in male; cell of fore wing more than two-thirds the length of costa; discocellulars inwardly oblique, the lower the longer; veinlet in cell immediately before vein 4; vein 3 shortly before end of cell; vein 2 about three times as far from end of cell as from base of wing; lower margin of cell bent upwards at origin of vein 3. Hind wing evenly rounded; vein 7 well before end of cell; discocellulars and vein 5 barely traceable; vein 3 from end of cell; vein 2 twice as far from base of wing as from end of cell. Hind tibiæ thickly fringed and with two pairs of spurs.

In the male there is a tuft of long hair-like scales attached to the submedian at the base of the abdominal fold on the underside.

vulpinus, Hübn.

And one unidentified species.

Confined to South America.

38. Genus Hantana.

Hantana, Moore, Lep. Ceyl. vol. i. p. 179 (1881).

Type, *infernus*, Felder.

Antennæ: club rather robust, bent at about a right angle. Palpi suberect; second joint pressed close against the face, third joint minute. Fore wing: inner and outer margins subequal; cell more than two-thirds the length of costa: no costal fold in male; vein 12 reaching costa well before the end of cell; discocellulars inwardly oblique, the lower the longer; lower branch of veinlet in cell just before vein 4; upper branch at vein 5; vein 3 shortly before end of cell; vein 2 about three times as far from end of cell as from base of wing. Hind wing evenly rounded; vein 7 well before the end of cell; discocellulars distinct, vein 5 barely traceable; vein 3 immediately before the end of cell; vein 2 twice as far from base of wing as from end of cell. Hind tibiæ with two pairs of spurs, and in the male with a long tuft of hairs attached near the proximal end.

infernus, Felder.

Habitat. Ceylon.

39. Genus Murgaria, nov.

Type, *albociliatus*, Mab.

Antennæ: club gradually thickened and tapering to a fine point, bent into a hook just beyond the thickest part. Palpi: second joint densely scaled, slightly inclined forward; third joint short, porrect. Fore wing: outer margin slightly longer than inner margin; male with a costal fold; cell more than two-thirds length of costa; vein 12 reaching costa before the end of cell; vein 10 equidistant from 9 and 11; upper discocellular minute; middle and lower discocellulars inwardly oblique, in the same straight line, the middle one the longer; vein 3 twice as far from 2 as from 4, more than three times as far from base of wing as from end of cell. Hind wing inconspicuously lobed; vein 7 more than twice as far from 8 as from 6; discocellulars erect; vein 5 wanting; vein 3 immediately before end of cell; vein 2 about equidistant from end of cell and base of wing. Hind tibiæ very slightly fringed and with two pairs of spurs.

albociliatus, Mab. ..... 1.

And an unidentified species.

Tropical America.

40. Genus Æthilla. (Plates II. fig. 16; III. fig. 5.)

Æthilla, Hewitson, Desc. Hesp. p. 55 (1868).

Type, *eleusinia*, Hewitson.

? *Eurypterus*, Mabille, Pet. Nouv. ii. p. 162 (1877).

Type, *gigas*, Mabille.

Antennæ: club hardly at all thickened, bent at about a right angle; terminal portion long. Palpi: second joint thickly scaled, hird joint minute. Fore wing: inner and outer margins subequal; cell two-thirds length of costa; no costal fold in male; vein 12 eaching costa just opposite end of cell; vein 11 opposite vein 3;

vein 9 remote from 10, close to end of cell; vein 6 from upper angle of cell; upper discocellular minute; middle discocellular erect, lower slightly inwardly oblique, the lower rather the longer; vein 3 well before end of cell, about equidistant from 2 and 4, and twice as far from base of wing as from end of cell. Hind wing triangular, hardly lobed at anal angle; vein 7 three times as far from 8 as from 6; discocellulars faint, erect; vein 3 well before end of cell, twice as far from 2 as from 4; vein 2 slightly nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs and with a long tuft of coarse hairs attached near the proximal end.

E. gigas, Mab., the type of *Eurypterus*, is not in B. M., but as the other two species, viz. *lavochrea*, Butler, and *coracina*, Butler, which M. Mabille puts into his genus, are congeneric with *eleusinia*, Hewitson, the type of *Æthilla*, therefore *gigas* also is presumably an *Æthilla*.

* *eleusinia*, Hew. ..... 1.
coracina, Butl. ..... 2.
* *epicra*, Hew. ..... 3.
* *echina*, Hew. ..... 4.
lavochrea, Butl. ..... 5.

And an unidentified species.

Confined to tropical America.

41. Genus Ancistrocampta.

Ancistrocampta, Feld. Wien. ent. Monat. vi. p. 183 (1862).

Type, *hiarbas*, Cramer.

Antennæ: club very slightly thickened, bent at more than a right angle, tapering to a fine point, the front edge of club fringed with short widely set bristles. Palpi: third joint almost invisible. Fore wing: inner and outer margins subequal; no costal fold in male; cell well over two-thirds the length of costa; vein 12 reaching costa well before the end of cell; discocellulars suberect; vein 5 slightly nearer to 6 than to 4; vein 3 well before end of cell, more than twice as far from 2 as from 4; vein 2 remote from 3, twice as far from end of cell as from base of wing. Hind wing: vein 7 shortly before end of cell; discocellulars very faint, slightly inwardly concave; vein 5 just traceable, nearer to 6 than to 4; vein 3 immediately before end of cell; vein 2 only slightly nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs, the upper pair minute, and with a tuft of hairs attached near the proximal end.

hiarbas, Cram. ..... 1.
* *suthina*, Hew. ..... 2.

Confined to tropical South America.

42. Genus Hydrænomia.

Hydrœnomia, Butler, Ent. Mon. Mag. vii. p. 99 (1870).

Type, *orcinus*, Felder.

Antennæ: club moderate, bent into a hook, terminal portion short. Palpi porrect, divergent; third joint slender, naked, rather short. Fore wing: inner margin longer than outer margin, the

latter excavated from vein 2 to the outer angle; cell two-thirds the length of costa; male with a costal fold; vein 12 reaching costa well before the end of cell; discocellulars suberect; vein 5 nearer to 6 than to 4; vein 3 shortly before end of cell, more than twice as far from 2 as from 4; vein 3 more than twice as far from end of cell as from base of wing. Hind wing: outer margin crenulated; vein 7 well before the end of cell; discocellulars and vein 5 barely traceable; vein 3 shortly before end of cell; vein 2 only slightly nearer to end of cell than to base of wing. Hind tibiæ slightly fringed and with two pairs of spurs.

orcinus, Felder.

Confined to tropical South America.

43. Genus Paradros, nov.

Type, *phœnice*, Hew.

Nearest to *Lignyostola*, Mab., with which it agrees in neuration, except that the veinlet in the cell terminates only just beyond vein 3, and that vein 2 of the fore wing is considerably nearer to the base of the wing. The antennæ are longer and have the club more bent round. The palpi are similar. The hind wing is quite a different shape, being much produced in the submedian area, while in *Lignyostola* it is much produced in the subcostal area. The anal lobe is also comparatively inconspicuous, the outer margin not being excised just before it.

* *phœnice*, Hew. ..... 1.
* *eous*, Hew. ..... 2.
alcmon, Cram. ..... 3.

Confined to South America.

44. Genus Lignyostola.

Lignyostola, Mabille, Le Naturaliste, p. 221 (1888).

Type, *pemphigargyra*, Mab.

Antennæ: club moderate, bent into an even curve, tapering to a fine point. Palpi porrect, divergent, third joint slender and naked. Fore wing: inner and outer margins subequal; cell more than two thirds the length of costa; vein 12 reaching costa well before the end of cell; veinlet in cell just before vein 5; discocellulars inwardly oblique, subequal, the middle one slightly convex; vein 3 shortly before end of cell, about three times as far from 2 as from 4; vein 3 twice as far from end of cell as from base of wing. Hind wing distinctly lobed; vein 7 well before end of cell, twice as far from 8 as from 6; discocellulars and vein 5 barely traceable; vein 3 immediately before end of cell; vein 2 considerably nearer to end of cell than to base of wing.

Male with a costal fold. Hind tibiæ densely fringed, and with two pairs of spurs, the upper pair short.

lacydus, Druce } ... 1.
pemphigargyra, Mab. }
crinisus, Cram. ..... 2.
despecta, Butler ..... 3.
formosus, Felder ..... 4.

And two unidentified species.

Confined to tropical America.

45. Genus Phanus. (Plate I. fig. 7.)

Phanus, Hübner, Verz. p. 114 (1816). Type, *vitreus*, Cramer.

Antennæ: club very gradually curved into a crescent, short, rather flattened, considerably thicker than shaft, tapering to a fine point. Palpi: second joint upturned, densely scaled; third joint naked, rather conspicuous. Fore wing: inner and outer margins subequal; male with a costal fold; cell more than two-thirds the length of costa; vein 12 reaching costa before end of cell; upper discocellular short but distinct, outwardly oblique; middle and lower discocellulars almost erect, the middle the longer; vein 3 rather more than twice as far from base of wing as from end of cell; vein 2 rather more than twice as far from end of cell as from base of wing. Hind wing prominently lobed at vein 1 *b*; vein 7 rather more than twice as far from 8 as from 6; discocellulars very faint, erect; vein 5 wanting; vein 3 from end of cell; vein 2 more than twice as far from base of wing as from end of cell. Hind tibiæ fringed and with two pairs of spurs.

vitreus, Cram. ..... 1.
momus, Fabr.
marshalli, Kirby ..... 2.

And one unidentified species.

Confined to tropical America.

46. Genus Hyalothyrus.

Hyalothyrus, Mabille, Ann. Ent. Belg. vol. xxi. p. 23 (1878). Type, *nitocris*, Cramer.

Antennæ rather long; club very slender, hardly thicker than shaft, bent into a slight curve. Palpi porrect, divergent; third joint long, slender, and naked. Fore wing: inner and outer margins subequal; male with a costal fold; cell more than two-thirds the length of costa; vein 12 reaching costa before the end of the cell; discocellulars inwardly oblique, subequal; vein 3 shortly before the end of cell, about three times as far from 2 as from 4; vein 2 three times as far from end of cell as from base of wing. Hind wing well before the end of cell; discocellulars and vein 5 barely traceable; vein 3 immediately before end of cell; vein 2 considerably nearer to end of cell than to base of wing. Hind tibiæ with only a terminal pair of spurs and without a brush. Closely allied to *Entheus*.

infernalis, Mösch. ..... 1.
neleus, Linn. ..... 2.
priscus, Feld.

Confined to South America.

47. Genus Entheus. (Plate III. fig. 9.)

Entheus, Hübn. Verz. p. 114 (1816). Type, *peleus*, Linn.
Phareas, Westw. Gen. D. L. p. 515 (1852). Types, *gentius*, Cr., and *peleus*, Linn.

Antennæ: club slender, evenly curved into a crescent. Palpi

porrect, divergent; third joint long and slender. Fore wing: inner margin longer than outer margin; no costal fold in male; cell two-thirds the length of costa; vein 12 reaching costa well before the end of cell; discocellulars suberect; vein 5 slightly nearer to 6 than to 4; vein 3 shortly before end of cell, more than three times as far from 2 as from 4; vein 2 rather more than twice as far from end of cell as from base of wing. Hind wing: vein 7 shortly before end of cell; discocellulars and vein 5 hardly traceable; vein 3 just before end of cell; vein 2 about equidistant from base of wing and end of cell. Hind tibiæ very short, only with terminal pair of spurs, which are very long.

In the male there is a tuft of hairs attached to the proximal end of the tibiæ, much exceeding the tibiæ in length, and fitting into a groove behind the first joint of the tarsi, which is much elongated and slightly swollen. In the female the hind tibiæ are longer than in the male, and the terminal spurs are shorter.

{*talaus*, Linn. ♂ ..... 1.
{*pelens*, Linn. ♀.

{*lemna*, Butl. ♂ ..... 2.
{*theorytus*, Hew. ♀.
gentius, Cram..... 3.

Confined to South America.

48. Genus Cabirus.

Cabirus, Hübn. Verz. p. 102 (1816). Type, *julettus*, Stoll.
Brontiades, Hübn. Verz. p. 113 (1816). Type, *procas*, Cram.

Antennæ: club very slender, almost filiform, almost straight. Third joint of palpi short, conical, projecting slightly from the clothing of the second joint. Fore wing: inner margin slightly longer than outer margin; no costal fold in male; cell more than three-fifths the length of costa; vein 12 reaching costa almost opposite to end of cell; discocellulars almost erect, subequal; vein 5 slightly nearer to 6 than to 4; vein 3 well before end of cell, less than twice as far from 2 as from 4; vein 2 remote from 3, more than twice as far from end of cell as from base of wing. Hind wing: vein 7 well before end of cell; discocellulars erect, very faint; vein 5 barely traceable, nearer to 6 than to 4; vein 3 just before the end of the cell, nearer to 4 than to 2; vein 2 about equidistant from base of wing and end of cell. Hind tibiæ with only a single pair of spurs.

Male with a tuft of hairs affixed at the proximal end of the hind tibiæ.

This genus is closely allied to *Entheus*.

procas, Cram. ..... 1.
julettus, Stoll ..... 2.

These two species are almost certainly sexes, *procas* being the male.

Confined to tropical South America.

49. Genus GRYNOPSIS, nov.

Type, *cœleste*, Westwood.

Antennæ rather long; club slender, hardly thicker than the shaft, the front edge of shaft fringed with short widely-set bristles. Third joint of palpi entirely concealed in the clothing of the second joint. Fore wing: outer margin almost half as long again as inner margin: male with a costal fold; vein 12 reaching costa before the end of cell; cell very long, considerably more than two-thirds the length of costa; discocellulars very oblique, subequal; vein 5 slightly nearer to 4 than to 6; the lower margin of the cell is bent up between veins 3 and 4, lying almost in the same straight line as the discocellulars; vein 3 well before the end of the cell; vein 2 remote from 3, as far from base of wing as 3 is from end of cell. Hind wing produced into a broad lobe, extending from vein 3 to the anal angle; vein 7 well before end of cell; discocellulars very faint; vein 5 barely traceable, much nearer to vein 4 than to 6; vein 3 from end of cell; vein 2 slightly nearer to end of cell than to base of wing. Hind tibiæ only with terminal pair of spurs.

Male with the abdominal margin clothed with long hair-like scales.

cœleste, Westwood ..... 1.

Inhabits tropical South America.

Synopsis of Genera of HESPERIINÆ.

Section B.

a. Antennæ: tip acuminate.
  a^1 Apex of fore wing not truncate.
    a^2. Outer margin of both wings even or only slightly sinuate (dentate in *Erites*).
      a^3. Apex of fore wing not falcate.
        a^4. Third joint of palpi short and inconspicuous.
          a^5. Hind wing conspicuously elongated.
            a^6. Third joint of palpi sharply conical.
              NEOXOMA, g. n. Type, *platon*, Feld. (1)
            b^6. Third joint of palpi bluntly conical.
              a^7. Male with a large patch of sexual scales on outer half of hind wing on upperside.
                ARTEUROTIA, Butl., Druce. Type, *tractipennis*, Butl., Dr. (2)
              b^7. No sexual patch of scales on upperside of hind wing in male.
                a^8. Vein 2 of hind wing almost equidistant from base of wing and end of cell.
                  SOPHISTA, Plötz. Type, *aristoteles*, Westw. (3)
                b^8. Vein 2, hind wing, twice as far from base of wing as from end of cell.
                  SATARUPA, Moore. Type, *gopala*, Moore. (4)
          b^5. Hind wing not at all or only slightly elongated.
            a^6. No costal fold on fore wing of male.
              a^7. Lower margin of cell of fore wing not strongly arched between origin of veins 2 and 3.
                a^8. No patch of sexual scales on upperside of hind wing in male.
                  a^9. Hind wing: outer margin sinuate.
                    a^{10}. Third joint of palpi porrected horizontally.

a^{11}. Vein 7 of hind wing as long as or longer than vein 2.

DAIMIO, Murr. Type, *tethys*, Mén. (5)

b^{11}. Vein 7 of hind wing shorter than vein 2.

a^{12}. Outer margin of hind wing rather dentate, the deepest excision being at vein 5.

ERITES, Mab. Type, *melania*, Mab. (6)

b^{12}. Outer margin of hind wing only slightly sinuate.

a^{13}. Lower margin of cell of fore wing between veins 2 and 3 slightly arched.

SARANGESA, Moore. Type, *purendra*, Moore. (7)

b^{13}. Lower margin of cell of fore wing between veins 2 and 3 straight.

COLADENIA, Moore. Type, *indrani*, Moore. (8)

b^{10}. Third joint of palpi suberect.

CELÆNORRHINUS, Hübn. Type, *eligius*, Cram. (9)

b^{9}. Hind wing: outer margin even.

a^{10}. Vein 7 of hind wing hardly nearer to 6 than to 8.

ODINA, Mab. Type, *chrysomelæna*, Mab. (10)

b^{10}. Vein 7 of hind wing considerably near to 6 than to 8.

a^{11}. Vein 3 of fore wing well before the end of cell.

a^{12}. Fore wing comparatively elongate.

PARAMIMUS, Hübn. Type, *scurra*, Hübn. (11)

b^{12}. Fore wing not elongate.

a^{13}. Inner margin of fore wing considerably longer than outer margin.

* PYTHONIDES, Hübn. Type, *cerialis*, Cram. (12)

* NISONIADES, Hübn. Type, *bromius*, Stoll. (13)

b^{13}. Inner and outer margins of fore wing subequal.

* CYCLOSÆMIA, Mab. Type, *herennius*, Cram. (14)

b^{11}. Vein 3 of fore wing immediately before end of cell.

ACHLYODES, Hübn. Type, *frederious*, Hübn. (15)

b^{8}. Male with a large patch of sexual scales on upperside of hind wing.

TRICHOSEMEIA, Holl. Type, *subolivescens*, Holl. (16)

b^{7}. Lower margin of cell of fore wing strongly arched between origins of veins 2 and 3.

TAGIADES, Hübn. Type, *japetus*, Cram. (17)

b^{6}. Male with a costal fold.

a^{7}. Costal fold large; apex of fore wing hardly produced, rounded. EAGRIS, Guenée. Type, *subadius*, Gray. (18)

b^{7}. Costal fold slight; apex of fore wing more produced, acute. ANASTRUS, Hübn. Type, *obscurus*, Hübn. (19)

b^{4}. Third joint of palpi porrect, conspicuous.

a^{5}. Male with a costal fold, costa of fore wing angled at about its centre.

CAMPTOPLEURA, Mab. Type, *theramenes*, Mab. (20)

b^{5}. No costal fold in male, costa of fore wing not angled.

a^{6}. Antennal club evenly curved.

POTAMANAX, g. n. Type, *flavofasciata*, Hew. (21)

* The slight differences in shape of wing between the type species of *Pythonides* and *Nisoniades* cannot be expressed in a key. Most probably these two genera, as well as *Cyclosæmia*, are not really sufficiently distinct to be kept separate, and it would be more correct to include all three genera under *Nisoniades*.

b^6. Antennal club hooked.
a^7. Vein 7 of hind wing nearer to 8 than to 6.
MYCTERIS, Mab. Type, *cærula*, Mab. (22)
b^7. Vein 7 of hind wing close to 6.
PELLICIA, H.-S. Type, *dimidiata*, H.-S. (23)
b^3. Apex of fore wing falcate. EANTIS, Boisd. Type, *busiris*, Cram. (24)
b^2. Outer margin of hind wing with a conspicuous projecting tooth at vein 7. ANTIGONUS, Hübn. Type, *nearchus*, Latr. (25)
c^2. Outer margin of hind wing very dentate.
DARPA, Moore. Type, *hauria*, Moore. (26)
b^1. Apex of fore wing broadly truncate (except in *Tapena agni*).
a^2. Male with a tuft of hairs on hind tibiæ.
a^3. Outer margin of hind wing not angled.
a^4. Third joint of palpi inconspicuous.
SPIONADES, Hübn. Type, *artemides*, Cram. (27)
b^4. Third joint of palpi conspicuous.
ANISOCHORIA, Mab. Type, *polysticta*, Mab. (28)
PROCAMPTA, Holl. Type, *rara*, Holl. (29)
b^3. Outer margin of hind wing angled at veins 7 and 4.
CTENOPTILUM, de N. Type, *vasava*, Moore. (30)
c^3. Outer margin of hind wing angled at vein 3 (except *agni*).
TAPENA, Moore. Type, *thwaitesi*, Moore. (31)
b^2. No tuft of hair on hind tibiæ of male.
NETROCORYNE, Feld. Type, *repanda*, Feld. (32)
b. Antennæ, tip blunt.
a^1. Fore wing, apex truncate.
a^2. Male with a recumbent tuft of hair on fore coxæ.
ODONTOPTILUM, de N. Type, *sura*, Moore. (33)
b^2. Male with a radiating tuft of hair on fore coxæ.
CAPRONA, Wallgr. Type, *pillaana*, Wallgr. (34)
b^1. Fore wing, apex acute.
a^2. Male with a radiating tuft of hair on fore coxæ.
LEUCOCHITONEA, Wallgr. Type, *levubu*, Wallgr. (35)
b^2. No tuft of hair on fore coxæ of male.
a^3. Vein 2 of hind wing considerably nearer to end of cell than to base of wing. ARANTIS, Hopff. Type, *tettensis*, Hopff. (36)
b^3. Vein 2 of hind wing hardly, if at all, nearer to end of cell than to base of wing.
a^4. Vein 2 of fore wing considerably nearer to base of wing than to vein 3.
a^5. Fore wing comparatively short and broad.
PHOLISORA, Sc. Type, *catullus*, Fabr. (41)
b^5. Fore wing comparatively elongate.
HELIOPETES, Billb. Type, *arsalte*, Linn. (37)
b^4. Vein 2 of fore wing hardly nearer to base than to vein 3.
a^5. Outer margin of hind wing even.
a^6. Antennal club straight.
GOMALIA, Moore. Type. *albofasciata*, Moore. (39)
b^6. Antennæ, club curved.
a^7. Club robust. HESPERIA, Fabr. Type, *malvæ*, Linn. (38)
b^7. Club comparatively slender.
THANAOS, Boisd. Type, *tages*, Linn. (42)
b^5. Outer margin of hind wing crenulated.
CARCHARODUS, Hbn. Type, *lavateræ*, Esp. (40)

1. Genus NEONOMA, nom. nov.

Conognathus, Felder, Wien. ent. Monat. vi. p. 181 (1862), præoc.
Type, *platon*, Feld.

Antennæ: club rather robust, bent into a hook, terminal portion short. Palpi widely separated, porrect; third joint sharply conical.

Fore wing: outer margin longer than inner margin; no costal fold in male: cell less than two-thirds the length of costa; vein 12 reaching costa shortly before the end of cell; discocellulars suberect; vein 5 nearer 6 than 4; veinlet from lower discocellular; vein 3 well before end of cell, twice as far from 2 as from 4; vein 2 twice as far from end of cell as from base of wing. Hind wing much produced; vein 7 nearer to base of wing than to end of cell; discocellulars and vein 5 very faint; vein 3 immediately before end of cell; vein 2 three times as far from base of wing as from end of cell. Hind tibiæ with two pairs of spurs.

platon, Fabr.

Confined to tropical America.

The genus *Garga* of Mabille ('Le Naturaliste,' p. 216, 1889), described for the species *olena*, is apparently congeneric with *conognathus*, and *olena* is probably identical with *platon*.

2. Genus Arteurotia.

Arteurotia, Butler & Druce, Cist. Ent. i. p. 112 (1872).
Type, *tractipennis*, Butler, Druce.

Antennæ: club rather robust, hooked, terminal portion short, less than half the length of club. Palpi porrect, widely separated; third joint obtusely conical. Fore wing: outer margin rather longer than inner margin; inner margin convex in its outer half; cell of fore wing less than two-thirds the length of costa; vein 12 reaching costa opposite end of cell; discocellulars suberect, the lower the longer; vein 3 shortly before end of cell, twice as far from 2 as from 4; vein 2 twice as far from end of cell as from base of wing. Hind wing elongate, outer margin straight; discocellulars distinct; vein 5 barely traceable; vein 3 immediately before end of cell; vein 2 hardly nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs.

The male is without a costal fold, but is provided with a large silky patch of appressed scales, occupying the apical half of the hind wing on the upperside.

tractipennis, Butl., Druce.

Confined to tropical America.

3. Genus Sophista.

Sophista, Plötz, Stett. ent. Zeit. xl. p. 176 (1879).
Type, *aristoteles*, Westw.

Antennæ: club moderate, bent into a hook, terminal portion very slender, less than half the length of remainder of club. Palpi porrect, widely separated; third joint obtusely conical. Fore wing: inner and outer margins subequal; cell of fore wing less than two-thirds the length of costa; vein 12 reaching costa almost opposite the end of cell; discocellulars suberect, the lower the longer; vein 3 shortly before the end of cell, more than twice as far from 2 as from 4; vein 2 more than twice as far from end of cell as from base of

wing. Hind wing rather elongate, outer margin slightly crenulate; discocellulars and vein 5 barely traceable; vein 3 immediately before the end of cell; vein 2 hardly nearer to the end of cell than to the base of wing. Hind tibiæ with two pairs of spurs.

There is no costal fold in the male of *aristoteles*, and a hardly perceptible one in the male of *calendris*.

* *aristoteles*, Westw. ..... 1.
* *calendris*, Hew. ..... 2.

Confined to tropical South America.

4. Genus Satarupa.

Satarupa, Moore, P. Z. S. 1865, p. 780. Type, *gopala*, Moore.

Antennæ: club slender, bent into a hook, terminal portion long. Palpi porrect; third joint short, bluntly conical. Fore wing: outer margin strongly oblique, inner and outer margins subequal; cell less than two-thirds the length of costa; discocellulars inwardly oblique; vein 12 reaching costa before the end of cell; vein 3 shortly before end of cell, twice as far from 2 as from 4; vein 2 twice as far from end of cell as from base of wing. Hind wing much elongated, outer margin sinuate; vein 7 well before end of cell, twice as far from 8 as from 6; vein 3 immediately before end of cell; vein 2 twice as far from base of wing as from end of cell.

In the type species vein 5 of the hind wing is well developed, but it is barely traceable in the other species of the genus.

Hind tibiæ with two pairs of spurs. In the male the hind tibiæ are fringed along their upper edge, and the inner side of the tibiæ is clothed with long coarse recumbent hairs.

Closely allied to *Daimio*, from which it may be separated by the shape of the wings, especially of the hind wing, by the much greater length and more decided hook in the terminal portion of the antennal club, and by the scaling of the hind tibiæ of the male.

A synopsis of species is appended.

A large transparent spot in cell of fore wing.....	*gopala*, Moore.	1.
No transparent spot in cell of fore wing.		
Underside: base of hind wing brown; abdomen banded with white, extremity brown	*sambara*, Moore.	2.
Underside: base of hind wing white; abdomen entirely white.....	**dohertyi*, sp. n.	3.
Underside: base of hind wing white; abdomen entirely black.....	*affinis*, Druce.	4.

Entirely confined to Asia.

Satarupa dohertyi, sp. nov.

Upperside dark brown. Fore wing with a series of seven transparent spots, three subapical and minute, the remainder in pairs in echelon to the submedian, there followed by an opaque white streak on inner margin. Hind wing with a broad white central band, outwardly bordered by a series of black spots; cilia chequered. Underside as above, but paler; the white band on hind wing of much greater extent, occupying the whole of the wing, with the

exception of a marginal band and a short costal streak; a series of black spots inside marginal band, and an isolated black spot at costal bifurcation. Abdomen above entirely white, beneath greyish white. Palpi dark above, grey below; legs grey.

Hab. Kumaon. Expanse 52 millim.

Closely allied to *S. sambara* and *S. affinis*. From the former it differs in its larger size (52 to 46 millim.), wholly white abdomen, and white base to hind wing on underside; from the latter it differs in the colour of the abdomen and in the lower spot of the central pair on the disk being nearer than the upper spot to the base of the wing, while in *affinis* the lower spot is nearer to the outer margin.

This is probably the species recorded from Kumaon by Mr. Doherty, after whom I have much pleasure in naming it.

5. Genus Daimio.

Daimio, Murray, Ent. Mon. Mag. vol. xi. p. 171 (1875).
Type, *tethys*, Mén.

Antennæ: club moderate, terminal crook bent at about right angles. Palpi porrect; third joint short, obtusely conical. Fore wing: outer margin slightly oblique; inner margin longer than outer margin; cell less than two-thirds the length of costa; vein 12 reaching costa before the end of cell; discocellulars suberect; vein 3 close to end of cell, more than twice as far from 2 as from 4; vein 2 twice as far from end of cell as from base of wing. Hind wing hardly elongated, outer margin sinuate; vein 7 shortly before end of cell, more than twice as far from 8 as from 6; discocellulars very faint, almost erect; vein 5 barely traceable; vein 3 shortly before end of cell; vein 2 twice as far from base of wing as from end of cell. Hind tibiæ with two pairs of spurs.

Male without costal fold, but with a tuft of hairs attached to the proximal end of hind tibiæ.

A synopsis of the species is given below.

Upperside of hind wing with no discal pale band.....	*tethys*, Mén.	1.
Upperside of hind wing with a discal pale band.		
With a large transparent spot in cell of fore wing. Cilia of hind wing white	*moorei*, Mab. **felderi*, Butl.	2.
Cilia of hind wing dark.		
Band on underside of hind wing of large extent, reaching up to or beyond the costal nervure.		
Black spots on upperside of hind wing prominent	*bhagava*, Moore.	3.
Black spots on upperside of hind wing merged in the marginal band	*sinica*, Felder.	4.
Band on underside of hind wing much restricted, not extending beyond the upper angle of cell.	*celebica*, Felder. **permena*, Hew.	5
With a small transparent spot in cell of fore wing, sometimes absent.		
A large transparent spot below cell, below which are two opaque ones reaching to inner margin. Band on hind wing broad	*narada*, Moore.	6.
A large transparent spot below cell, with no opaque spots below it. Band on hind wing narrow ...	*phisara*, Moore.	

Confined to Asia.

6. Genus Erites.

Erites, Mab. Bull. Soc. Ent. Belge, p. lxxi (1891).

Type, *melania*, Mab.

Very close to *Sarangesa*, from which it may be separated by the more dentate margin to the hind wing, and by the lower margin of the cell between veins 2 and 3 being straight.

djælælæ, Wllgr.

And one unidentified species.

A species closely allied to *motozi*, Wllgr., had been wrongly identified as *djælælæ* in the British Museum collection. Therefore all Mr. Butler's records of *djælælæ* really apply to this other species, which is apparently unnamed, and which is in the British Museum from Aden, Wadelai, Somali, and Abyssinia, the true *djælælæ* being represented only from British Caffraria, Cape of Good Hope, Transvaal, and Natal.

7. Genus Sarangesa.

Sarangesa, Moore, Lep. Ceyl. i. p. 176 (1881).

Type, *purendra*, Moore.

Hyda, Mabille, Bull. Soc. Ent. Fr. (6) ix. p. clxxxiii (1889).

Type, *micacea*, Mab.

Sape, Mabille, Bull. Soc. Ent. Belge, p. lxvii (1891).

Type, *lucidella*, Mab.

Antennæ: club moderate, slightly recurved. Palpi porrect; third joint short, bluntly conical. Fore wing: inner margin longer than outer margin; cell less than two-thirds the length of costa; vein 12 reaching costa well before end of cell; discocellulars suberect, the lower the longer; vein 3 shortly before the end of cell; vein 2 nearly three times as far from end of cell as from base of wing; the lower margin of cell slightly arched between the origins of veins 2 and 3. Hind wing: outer margin slightly sinuate; vein 7 very shortly before end of cell; discocellulars and vein 5 barely traceable; vein 3 immediately before end of cell; vein 2 hardly nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs in some species, with a tuft of hairs attached to the proximal end.

**purendra*, Moore ..... 1.	*agrisca*, Hew..... 5.
sati, de Nicéville ..... 2.	*micacea*, Mab.
dasahara, Moore ..... 3.	*motozi*, Wllgr. ..... 6.
albicilia, Moore ..... 4.	*kobela*, Trimen ..... 7.
	phyllophyla, Trimen ..... 8.

And seven unidentified species.

The genus *Sape* has been erected by Mabille for *motozi* and its allies, but these species all fall into the genus *Sarangesa*. The species *micacea* is one of the many species described by Hewitson which have been redescribed by Mabille.

Asiatic and African.

8. Genus Coladenia.

Coladenia, Moore, Lep. Ceyl. i. p. 180 (1881).

Type, *indrani*, Moore.

Antennæ: club rather robust, recurved at tip. Palpi porrect; third joint short, obtusely conical. Fore wing: inner and outer margins subequal; cell less than two-thirds the length of costa; vein 12 reaching costa well before the end of cell; discocellulars suberect, the lower the longer; vein 3 shortly before the end of cell; vein 2 more than twice as far from end of cell as from base of wing. Hind wing: outer margin sinuate; vein 7 very close to end of cell; discocellulars and vein 5 barely traceable; vein 3 immediately before end of cell; vein 2 considerably nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs, and in the male with a very long tuft of hair attached to the proximal end.

indrani, Moore ..... 1.
tissa, Moore ..... 2.
fatih, Kollar ..... 3.
dan, Fabr. ..... 4.
**kehelatha*, Hew. ..... 5.

And one unidentified species.
Asiatic and African.

9. Genus Celænorrhinus.

Celænorrhinus, Hübn. Verz. p. 106 (1816). Type, *eligius*, Cramer.
Gehlota, Doherty, J. As. Soc. Beng. vol. lviii. pt. 2, p. 131 (1889).

Type, *sumitra*, Moore.

Antennæ: club moderate, recurved at apex. Palpi suberect, terminal joint minute, second joint pressed close against the face. Fore wing: inner and outer margins subequal; cell less than two thirds the length of costa; vein 12 reaching costa almost opposite the end of cell; discocellulars suberect, the lower the longer; vein 3 shortly before the end of cell; vein 2 more than twice as far from end of cell as from base of wing. Hind wing: outer margin sinuate; vein 7 well before the end of cell, about twice as far from vein 8 as from 6; discocellulars faint, erect; vein 5 barely traceable; vein 3 immediately before the end of cell; vein 2 twice as far from base of wing as from end of cell. Hind tibiæ with two pairs of spurs, and in the male with a tuft of hairs attached near the proximal end.

eligius, Cramer ..... 1.
**astrigera*, Butler ..... 2.
**cynapes*, Hew. ..... 3.
**badia*, Hew. ..... 4.
**shema*, Hew. ..... 5.
**simula*, Hew. ..... 6.
spilothyrus, Feld. ..... 7.
**fusca*, Hampson ..... 8.
chamunda, Moore ..... 9.
ambarvesa, Moore ..... 10.
sumitra, Moore ..... 11.
putra, Moore ..... 12.
leucocera, Kollar ..... 13.
munda, Moore.
pero, de Nicéville ..... 14.
**palomaya*, Moore ..... 15.
pyrrha, de Nicéville ..... 16.
maculosa, Felder ..... 17.
**biseriata*, Butler ..... 18.
**maculata*, Hampson ..... 19.
**meditrina*, Hewitson ..... 20.
galenus, Fabr. ..... 21.
**boadicea*, Hew. ..... 22.
lugens, Mab. ..... 23.
proxima, Mab. ..... 24.
cacus, de Nicéville ..... 25.
**asmara*, Butler ..... 26.
consertus, de Nicéville.

area, Plötz ..... 27.
dhanada, Moore ..... 28.
**aurivittata*, Moore ..... 29.
mokeezi, Wllgr. ..... 30.

This is a cosmopolitan genus, species belonging to it occurring in Asia, Africa, and South America.

10. Genus Odina.

Odina, Mabille, C. R. Ent. Soc. Belg. p. cxiii (1891).
Type, *chrysomelæna*, Mab.

Antennæ moderate, with a slender recurved crook. Palpi: third joint stout, porrect, rather conspicuous. Fore wing: inner margin longer than outer margin; cell less than two-thirds the length of costa; vein 5 nearer to 6 than to 4; vein 3 close to the end of cell; vein 2 from close to base of wing. Hind wing: outer margin even; vein 7 well before end of cell, only slightly nearer to 6 than to 8; vein 3 immediately before the end of cell; vein 2 nearer to base of wing than to end of cell. Hind tibiæ with two pairs of spurs. No secondary sexual characters on wings.

hieroglyphica, Butl. ..... 1.
chrysomelæna, Mab.
**decoratus*, Hew. ..... 2.

Confined to the Indian and Malay regions.

The type of this genus is one of the many well-known species recently redescribed by M. Mabille.

11. Genus Paramimus.

Paramimus, Hübn. Verz. p. 115 (1816). Type, *scurra*, Hübn.

Antennæ: club slight, evenly curved. Palpi porrect, widely separated; third joint short, obtusely conical. Fore wing very elongated; inner margin very much longer than outer margin; cell of fore wing less than two-thirds the length of costa; vein 12 reaching costa almost opposite the end of cell; discocellulars erect, the lower the longer; vein 3 shortly before the end of cell, more than twice as far from 2 as from 4; vein 2 twice as far from end of cell as from base of wing. Hind wing: outer margin evenly rounded; vein 7 shortly before end of cell; discocellulars and vein 5 barely traceable; vein 3 shortly before end of cell; vein 2 only slightly nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs, the upper pair minute. No costal fold in male, but a tuft of hairs attached to the proximal end of hind tibiæ.

scurra, Hübn. ..... 1.
hemes, Cram. ..... 2.
**lucaria*, Hew. ..... 3.
stigma, Feld. ..... 4.
**empolæus*, Westw. ..... 5.

And two unidentified species.

Confined to tropical America

12. Genus Pythonides.

Pythonides, Hübn. Verz. p. 111 (1816). Type, *cerialis*, Cram.

Antennæ: club moderate, more or less curved, but not hooked. Palpi porrect; third joint short, bluntly conical. Fore wing: inner margin considerably longer than outer margin; costa in some species very strongly arched; outer margin slightly excavated just above outer angle; cell less than two-thirds the length of costa; vein 12 reaching costa before the end of cell; discocellulars erect, the lower the longer; vein 3 shortly before the end of cell; vein 2 hardly nearer to base of wing than to end of cell. Hind wing: outer margin evenly rounded; discocellulars and vein 5 barely traceable; vein 3 immediately before the end of cell; vein 2 twice as far from base of wing as from end of cell. No costal fold in male.

This genus can be divided into two groups on the characters of the hind tibiæ.

A. Two pairs of spurs on hind tibiæ, no tuft of hairs in male.

cerialis, Cram. / *orcus*, Fabr. ..... 1.
orcus, Hübn. ..... 2.
festivus, Erich. ..... 3.
**inculica*, Hew. ..... 4.
cronion, Feld. ..... 5.
scintillans, Mab. ..... 6.
geometrina, Feld. ..... 7.
hadina, Butl. ..... 8.
lancea, Hew. / *jovianus*, Hübn. ..... 9.
satyrina, Feld. ..... 10.
satyrus, Feld. ..... 11.

And three unidentified species.

B. Only terminal pair of spurs on hind tibiæ; male with a tuft of hairs affixed near proximal end of tibia.

**ferina*, Hew. ..... 1.
lagia, Hew. ..... 2.
hercunius, Hübn. ..... 3.
gladiatus, Butl. ..... 4.
**laxus*, Hew. ..... 5.
jovianus, Cram. / *pseudojovianus*, West. / *pluvius*, H.-S. ..... 6.
fabricii, Kirby / *jovianus*, Fabr. ..... 7.
pyralina, Mösch.

And five unidentified species.
Confined to tropical America.

13. Genus Nisoniades.

Nisoniades, Hübn. Verz. p. 108 (1816). Type, *bromius*, Stoll.

Antennæ: club slender, evenly curved. Third joint of palpi minute, bluntly conical. Fore wing: costa straight, apex rather acute; inner margin considerably longer than outer margin; cell of fore wing less than two-thirds the length of costa; vein 12 reaching costa almost opposite the end of cell; discocellulars slightly inwardly oblique; vein 3 shortly before end of cell, more than three times as far from 2 as from 4; vein 2 more than twice as far from end of cell as from base of wing. Hind wing evenly rounded; vein 7 close to end of cell; discocellulars and vein 5 barely traceable; vein 3 immediately before end of cell; vein 2 slightly nearer to end of cell than to base of wing. Hind tibiæ fringed, and with two pairs of spurs.

This genus appears always to have an ocellated spot at the end of the cell in fore wing, a character which is more developed in *Cyclosæmia*.

bromius, Stoll.

And two unidentified species.
Confined to tropical South America.

14. Genus Cyclosæmia.

Cyclosæmia, Mab. Pet. Nouv. ii. p. 222 (1878).
Type, *herennius*, Cramer.

Antennæ: club slender, evenly curved. Palpi porrect, third joint short, bluntly conical. Fore wing short and broad, costa slightly convex, apex rounded, outer margin very convex; inner and outer margins subequal; cell less than two thirds the length of costa; vein 12 reaching costa almost opposite the end of cell; discocellulars suberect, the lower the longer; vein 1 shortly before end of cell, more than twice as far from 2 as from 4; vein 2 less than twice as far from base of wing as from end of cell. Hind wing evenly rounded; vein 7 well before end of cell: discocellulars and vein 5 barely traceable; vein 3 shortly before the end of cell; vein 2 nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs, and fringed with exceptionally long hairs.

herennius, Cram. ..... 1.
anastomosis, Mab. ..... 2.
**lyrcea*, Hew. ..... 3.
**elelea*, Hew. ..... 4.
**lathæa*, Hew. ..... 5.
fissimacula, Mab. ..... 6.
**falisca*, Hew.
**carina*, Hew. ..... 7.
albata, Mab. ..... 8.

And two unidentified species.
Confined to tropical America.

15. Genus Achlyodes.

Achlyodes, Hübner, Verz. 107 (1816). Type, *fredericus*, Hübn.

Antennæ: club moderate, slightly bent, tapering to a fine point. Palpi porrect; terminal joint minute. Fore wing: inner margin considerably longer than outer margin; no costal fold on fore wing; cell of fore wing less than two-thirds the length of costa; vein 12 reaching costa before the end of cell; discocellulars suberect, the lower the longer; vein 3 immediately before the end of cell; vein 2 less than twice as far from end of cell as from base of wing. Hind wing evenly rounded; vein 7 shortly before the end of cell; discocellulars and vein 5 faint; vein 3 from end of cell; vein 2 hardly nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs.

fredericus, Hübn.

And four unnamed species.
Confined to tropical America.

16. Genus Trichosemeia.

Trichosemeia, Holland, Ann. Nat. Hist. (6) x. p. 294 (1892).
Type, *subolivescens*, Holland.

Antennæ: club moderate, evenly curved. Palpi porrect; third joint short, obtusely conical. Fore wing: inner margin longer than outer margin; cell less than two-thirds the length of costa; vein 12 reaching costa almost opposite end of cell; discocellulars slightly inwardly oblique, the lower the longer; vein 3 shortly before end of cell; vein 2 twice as far from end of cell as from base of wing. Hind wing evenly rounded; vein 7 very close to end of cell; discocellulars and vein 5 barely traceable; vein 2 immediately before end of cell; vein 3 considerably nearer to end of cell than to base of wing.

Male: no costal fold on fore wing, but with a large patch of appressed scales on the upperside of the hind wing, occupying the basal half of the wing from the costa to the middle of cell. The inner margin of the fore wing on the underside is also clothed with modified scales, presenting a silky appearance, and bearing a tuft of hairs attached to the submedian near the base. The hind tibiæ are flattened, and bear a tuft of hairs attached along their inner surface.

There are three species of this genus in the British Museum from W. Africa, two being unidentified, and the third being *pulvina*, Plötz. All these three species present slight modifications in the extent of the sexual patches on both wings, and in *pulvina* the hind tibiæ are only fringed, and exhibit no trace of the tibial tuft.

17. Genus Tagiades. (Plates I. fig. 9; III. fig. 11.)

Tagiades, Hübner, Verz. p. 108 (1816). Type, *japetus* Cram.
Pterygospidea, Wallgr. Rhop. Caffr. p. 53 (1857).
Type, *flesus*, Fabr.

Antennæ: club slender, bent at about a right angle, terminal portion rather long. Palpi porrect, third joint minute. Fore wing: inner and outer margins subequal; cell less than two-thirds the length of costa; vein 12 reaching costa well before end of cell; discocellulars suberect, the lower the longer; vein 3 shortly before end of cell, three times as far from 2 as from 4; vein 2 almost twice as far from end of cell as from base of wing; lower margin of cell between origins of veins 2 and 3 strongly arched. Hind wing evenly rounded; vein 7 well before the end of cell, about twice as far from 8 as from 6; discocellulars and vein 5 very faint; vein 3 shortly before end of cell, twice as far from 2 as from 4; vein 2 considerably nearer to end of cell than to base of wing. Hind tibiæ fringed, and with two pairs of spurs.

It is quite impracticable to separate *Pterygospidea* from *Tagiades*, the only difference being that in *flesus* the outer margin of the fore wing is slightly excavated just above the outer angle, which is not the case in *japetus*; when, however, one tries to apply this

difference to other species it is found to be a vanishing quantity, and quite valueless as a generic character.

flesus, Fabr. ..... 1.
ophion, Drury.
insularis, Mab. ..... 2.
ravi, Moore ..... 3.
khasiana, Moore ..... 4.
**meetana*, Moore ..... 5.
japetus, Cramer ..... 6.
alica, Moore ..... 7.
obscurus, Mab. ..... 8.
distans, Moore ..... 9.
gana, Moore ..... 10.
* *clericus*, Butler ..... 11.
* *presbyter*, Butler ..... 12.
atticus, Moore ..... 13.
caligana, Distant ..... 14.
* *menaka*, Moore ..... 15.
* *piwilli*, Butler ..... 16.
* *tabrica*, Hew. ..... 17.
pralaya, Moore ..... 18.
trichoneura, Felder ..... 19.
* *lavata*, Butler ..... 20.

And ten unidentified species. There is no doubt that several of the above species will be found to be identical when better series are brought together.

Asiatic and African.

18. Genus Eagris.

Eagris, Guenée, in Maill. Réun. ii. Lép. p. 19 (1863).
Type, *sabadius*, Gray.

Palpi and neuration of fore wing as in *Tagiades*. Antennæ: club more robust and terminal portion shorter. Hind wing: vein 7 nearer to end of cell, and vein 2 nearer to base of wing.

Male with a costal fold on fore wing, and with a tuft of hair attached near the proximal end of hind tibiæ.

sabadius, Gray ..... 1.
nottoana, Wallgr. ..... 2.

Confined to Africa.

19. Genus Anastrus.

Anastrus, Hbn. Ex. Schmett. ii. 1822–26. Type, *obscurus*, Hbn.

Antennæ: club rather slender, very gradually thickened, bent into an even curve, tip acuminate. Palpi porrect; second joint as seen from above broad, rectangular, closely scaled; third joint minute, bluntly conical. Fore wing: inner and outer margin subequal; cell of fore wing less than two-thirds the length of costa; discocellulars suberect, the lower the longer; vein 3 well before the end of cell, three times as far from 2 as from 4; vein 2 more than twice as far from end of cell as from base of wing. Hind wing evenly rounded, slightly lobate; vein 7 shortly before end of cell; discocellulars and vein 5 faint; vein 3 immediately before end of cell; vein 2 twice as far from base of wing as from end of cell. Hind tibiæ with two pairs of spurs.

Male with a very slight costal fold, and with a tuft of hair near the proximal end of hind tibiæ.

obscurus, Hübn. ..... 1.
petius, Mösch. ..... 2.
simplicia, Mösch. ..... 3.

And four unidentified species. *Corbulo*, Cram., has been considered

by authors identical with *obscurus*, Hübn., but the former is described and figured with two transparent apical spots, which are wanting in *obscurus*.

Confined to tropical America.

20. Genus Camptopleura. (Plate III. fig. 12.)

Camptopleura, Mab. Pet. Nouv. ii. p. 166 (1877).

Type, *theramenes*, Mab.

Antennæ: club moderate, evenly curved, finely pointed. Palpi porrect, conspicuous; third joint stout, bluntly conical. Fore wing: male with a costal fold; costa angled just beyond the fold; cell less than two-thirds the length of costa; vein 12 reaching costa well before the end of cell; discocellulars inwardly oblique, the lower the longer; vein 3 very close to end of cell; vein 2 twice as far from end of cell as from base of wing. Hind wing evenly rounded; vein 7 shortly before end of cell; discocellulars and vein 5 barely traceable; vein 3 immediately before end of cell; vein 2 considerably nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs, and in the male with a tuft of hairs attached near the proximal end of the hind tibiæ.

theramenes, Mab. ..... 1.
iphicrates, Mab. ..... 2.
ebenus, Mab. ..... 3.
thrasybulus, Fabr. ..... 4.

And two unidentified species, one of which is Butler's female type of *Achlyodes nyctineme*, his male type of which is a female of the genus *Pellicia*.

Confined to tropical South America.

21. Genus Potamanax, nov.

Type, *flavofasciata*, Hew.

Antennæ: club rather robust, slightly flattened, evenly curved. Palpi porrect, divergent; third joint rather prominent. Fore wing: costa much arched, inner margin longer than outer margin; cell of fore wing less than two-thirds the length of costa; vein 12 reaching costa well before the end of cell; discocellulars erect, the lower the longer; vein 3 shortly before the end of cell; vein 2 hardly nearer to base of wing than to end of cell. Hind wing evenly rounded; vein 7 very close to end of cell; discocellulars erect and in the same straight line; vein 5 barely traceable; vein 3 immediately before end of cell; vein 2 more than twice as far from base of wing as from end of cell. Hind tibiæ with two pairs of spurs; no secondary sexual characters in male.

* *flavofasciata*, Hew. ... 1.
* *thestia*, Hew. ..... 2.
* *latrea*, Hew. ..... 3.
* *thoria*, Hew. ..... 4.
unifasciata, Feld. ..... 5.

Confined to tropical South America.

22. Genus Mycteris. (Plate III. fig. 13.)

Mycteris, Mab. Pet. Nouv. p. 114 (1877). Type, *cærula*, Mab.

Antennæ: club moderate, hooked, terminal portion very short. Palpi very prominent, porrect; second and third joint taken together forming an elongated triangle; third joint rapidly tapering, tip blunt. Fore wing produced at apex; inner and outer margins subequal; cell of fore wing less than two-thirds the length of costa; vein 12 reaching costa almost opposite the end of cell; vein 3 shortly before the end of cell; vein 2 very close to base of wing; discocellulars suberect, the lower the longer. Hind wing evenly rounded; *vein 7 nearer to* 8 *than to* 6; discocellulars and vein 5 faint; vein 3 immediately before end of cell; vein 2 nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs; on costal fold in male, but a short tuft of erectile hairs on upperside of hind wing, attached along vein 8; at the bifurcation of vein 7 the veins at the fork are conspicuously dilated. The position of vein 7 seems quite unique among the Hesperiid genera.

cærula, Mab. ..... 1.
* *casabyses*, Hew. ..... 2.

And two unnamed species.

Confined to tropical South America.

23. Genus Pellicia.

Pellicia (Plötz, MS.), H.-S. Corresp.-Bl. zool.-min. Verein. Regens. xxiv. p. 159 (1870). Type, *dimidiata*, H.-S.

Antennæ: club moderate, bent into a hook, terminal portion slender. Palpi porrect; third joint short, obtusely conical. Fore wing: inner margin shorter than outer margin; no costal fold in male; cell less than two-thirds the length of costa; vein 12 reaching costa almost opposite the end of cell; discocellulars slightly inwardly oblique, the lower the longer; vein 3 close to end of cell; vein 2 twice as far from end of cell as from base of wing. Hind wing slightly elongated, outer margin inconspicuously sinuated; cell very short, extending less than half across the wing; vein 7 shortly before the end of cell; discocellulars and vein 5 faint; vein 3 from end of cell; vein 2 about equidistant from base of wing and from end of cell. Hind tibiæ fringed, and with two pairs of spurs. Male with a tuft of hairs on upperside of hind wing, attached along vein 8, and pointing downwards; at the bifurcation of vein 7 that vein and the upper margin of the cell are distinctly swollen for a short distance. This character of the swollen veins was pointed out to me by Mr. Salvin, to whom I am indebted for many valuable suggestions; it also obtains in the genus *Mycteris*, which, however, can be separated readily by the form of the palpi.

* *nyctineme*, Butl. ..... 1.
* *castolus*, Hew. ..... 2.
ithrana, Butl. ..... 3.

And three unnamed species.

In spite of its very different colouring, *ithrana* appears to be quite

inseparable in structure from *nyctineme*, and the prehensores of both species are very similar.

Butler's male type of *nyctineme* is a female, his female type being an unidentified species of the genus *Camptopleura*; the true male of *nyctineme* does not differ appreciably in markings from the female, though it differs of course in the secondary sexual characters of the genus, and also slightly in shape of wings, as in other species of the genus.

Confined to tropical America.

24. Genus Eantis. (Plates I. fig. 10; II. fig. 14; III. fig. 17.)

Eantis, Boisd. Spec. Gén. pl. 9 B (1836). Type, *busiris*, Cram.

Antennæ: club very slender, hardly thicker than shaft, evenly curved, terminating in a fine point. Palpi as in *Anastrus*. Fore wing: apex conspicuously falcate, outer margin very convex; inner margin slightly longer than outer margin; cell less than two-thirds the length of costa; vein 12 reaching costa at about half its length, considerably before the end of cell; middle discocellular erect, lower discocellular inwardly oblique, the lower the longer; vein 3 well before end of cell, less than twice as far from vein 2 as from 4; vein 2 nearer to base of wing than to end of cell. Hind wing much produced in median area, giving a very square appearance to the wing; cell short; vein 7 shortly before the end of cell; discocellulars barely traceable; vein 5 almost invisible; vein 3 shortly before the end of cell, slightly nearer to 4 than to 2; vein 2 nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs, and in the male with a tuft of hairs attached near the proximal end.

In the male of *busiris* there is also a tuft of short hairs on a black silky patch of closely appressed scales at the extreme base of the costal margin on upperside of hind wing, and a precisely similar patch on underside of fore wing at origin of vein 1. This sexual character is not found in any other species of the genus.

busiris, Cram. / *sebaldus*, Fabr.	1.	*pallida*, Felder / *ozotes*, Butler.	5.
thraso, Hübn.	2.	*mexicana*, Felder	6.
papinianus, Poey	3.	*mithridates*, Fabr.	7.
rossine, Butler	4.		

And one unidentified species.

Confined to tropical America.

25. Genus Antigonus.

Antigonus, Hübn. Verz. p. 108 (1816). Type, *nearchus*, Latr.
Chelonoeura, Feld. Wien. ent. Monat. vi. p. 185 (1862). Type, *nearchus*, Latr.

Antennæ: club moderate, more or less bent into a curve, sometimes hooked. Palpi as in *Anastrus*. Fore wing: inner margin very concave; outer angle produced into a lobe; outer margin longer than inner margin; cell of fore wing less than two-thirds the length

of costa; vein 12 terminating well before end of cell; vein 10 remote from 9; veins 7, 8, 9 all from the same spot; discocellulars suberect, the lower the longer; vein 3 shortly before end of cell; vein 2 close to base of wing. Hind wing produced into a tooth at end of vein 7; discocellulars and vein 5 barely traceable; vein 3 immediately before end of cell; vein 2 considerably nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs, upper pair short.

Male with a costal fold, and with a tuft of hair attached near proximal end of hind tibiæ.

nearchus, Latr. ..... 1.
ustus, Hübn.
hippalus, Feld.
crosus, Hübn. ..... 2.
westermanni, Latr.

Confined to tropical America.

26. Genus Darpa.

Darpa, Moore, Proc. Zool. Soc. Lond. p. 781 (1865).

Type, *hanria*, Moore.

Antennæ: club moderate, rather elongate, with a short terminal crook; tip sharp. Palpi porrect, third joint almost entirely concealed in clothing of second joint. Fore wing: outer margin very dentate; inner margin longer than outer margin; no costal fold in male; cell of fore wing less than two-thirds the length of costa; vein 12 terminating well before the end of cell; discocellulars inwardly oblique, the lower much the longer; vein 3 shortly before end of cell; vein 2 very close to base of wing, quite three times as far from end of cell as from base of wing. Hind wing slightly elongate, outer margin strongly dentate; vein 7 very close to end of cell; discocellulars and vein 5 traceable, but not fully developed; vein 3 immediately before end of cell; vein 2 considerably nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs. Hind tibiæ and femora with very long fringes.

hanria, Moore.

Confined to the Oriental region.

27. Genus Spionades.

Spionades, Hübn. Verz. p. 114 (1816). Type, *artemides*, Cramer.

Antennæ: club moderate, crook short, bent at about a right angle; tip acuminate. Palpi porrect, terminal joint almost entirely concealed in the clothing of the second joint. Fore wing: costa strongly arched, apex broadly truncate; inner margin slightly longer than outer margin; no costal fold in male; cell of fore wing less than two-thirds the length of costa; vein 12 reaching costa well before the end of cell; discocellulars suberect, the lower the longer; vein 3 very close to end of cell; vein 2 more than twice as far from end of cell as from base of wing. Hind wing elongated; vein 7 well before end of cell; discocellulars and vein 5 barely traceable;

vein 3 immediately before the end of cell; vein 2 considerably nearer to end of cell than to base of wing. Hind tibiæ with two pairs of long spurs, and in the male with a tuft of erect hairs attached near the proximal end.

In the female the fore wing is much more truncate, and the hind wing is broader, and therefore appears less elongated.

artemides, Cramer.

And an unidentified species. Allied to the Asiatic genus *Darpa*.

Habitat. Tropical South America.

28. Genus ANISOCHORIA. (Plates I. fig. 8; III. fig. 10.)

Anisochoria, Mab. Bull. Soc. Ent. Fr. (5) vi. p. 200 (1876).
Type, *polysticta*, Mab.

Antennæ rather short, less than half the length of fore wing; club robust, flattened, curved, terminating in a fine point. Palpi very conspicuous, porrect; second joint long, densely clothed; terminal joint short, obtusely conical. Fore wing: costa convex at middle, and slightly concave before apex; apex truncate and slightly excised; inner margin concave; cell less than two-thirds the length of costa; vein 12 reaching costa well before the end of cell; discocellulars slightly inwardly oblique, the lower the longer; vein 3 immediately before end of cell; vein 2 almost equidistant from 3 and from base of wing. Hind wing: outer margin evenly rounded; discocellulars very faint; vein 5 invisible; vein 3 immediately before end of cell; vein 2 nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs.

Male with a slight costal fold.

albiplaga, Feld. ..... 1.
palpalis, Latr. ..... 2.
lemur, Mösch. ..... 3.
sublimbata, Mab.
pedaliodina, Butl. ..... 4.
polysticta, Mab.

Confined to tropical South America.

29. Genus PROCAMPTA.

Procampta, Holland, Ann. Nat. Hist. (6) x. p. 293 (1892).
Type, *rara*, Holland.

"Allied to *Anisochoria*, Mab. Body slender. Palpi moderately long, slender, porrect, appressed, with the second article heavily clothed with hairs, and the terminal article slender. Fore wing rounded at base, convex on middle of costa, and slightly concave before apex; apex truncate, outer margin straight; outer angle not rounded, inner margin straight. Posterior wing subpyriform, and very convex on outer margin." (*Holland*, l. c.)

This genus agrees exactly with *Anisochoria* in shape of wings and form of palpi; the neuration I have had no opportunity to compare. The two genera are hardly likely to be identical, as one is found only in South America and the other in Africa.

30. Genus Ctenoptilum.

Ctenoptilum, de Nicéville, Journ. Bomb. Nat. Hist. Soc. vol. v. p. 220 (1890). Type, *vasava*, Moore.

Antennæ: club rather robust, gradually thickened, recurved, finely pointed. Palpi very conspicuous, porrect; third joint fairly robust, long, slightly curving downwards, bluntly pointed. Fore wing: costa straight, apex broadly truncate; inner and outer margins subequal; cell almost two-thirds the length of costa; vein 12 reaching costa far before the end of cell; vein 8 usually given out beyond the end of cell—that is, veins 7 and 8 anastomose for a portion of their basal length (this is not an invariable character; the length of the anastomosis varies in different specimens, and occasionally, though very rarely, veins 7 and 8 are free for their entire length); discocellulars taken together forming a curve, the lower the longer; vein 3 shortly before the end of cell; vein 2 considerably nearer to vein 3 than to base of wing. Hind wing: outer margin with a tooth-like projection at vein 7 and a second more prominent one at vein 4; from this latter projection to the anal angle the margin is perfectly straight, thus giving the wing a very squared appearance. Neuration of hind wing much as in *Odontoptilum*. Hind tibiæ with two pairs of spurs, the upper pair minute. Male with a long tuft of hair attached to the proximal end of hind tibiæ.

vasava, Moore ..... 1.
multiguttata, de Nicév. ..... 2.

This genus is closely allied to *Caprona* and *Odontoptilum*; the sharply pointed antennæ, however, will at once separate it.

Confined to Asia.

31. Genus Tapena.

Tapena, Moore, Lep. Ceyl. i. p. 181 (1881).
Type, *thwaitesi*, Moore.

Antennæ: club moderate, hooked, tip acuminate. Palpi conspicuous, porrect; third joint, short, obtusely conical. Fore wing: apex broadly truncate; inner and outer margins subequal; no costal fold in male; cell less than two-thirds the length of costa; vein 12 reaching costa before the end of cell; discocellulars suberect, the lower the longer; vein 3 shortly before the end of cell; vein 2 about twice as far from end of cell as from base of wing. Hind wing: outer margin sinuate, produced at vein 3, giving the wing a squared appearance; vein 7 well before the end of cell; discocellulars and vein 5 faint; vein 3 immediately before end of cell; vein 2 considerably nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs. Male with a tuft of long hair-like scales attached along the inner side of the hind tibiæ.

The species *agni* differs from the type in the outer margins of both wings being even, but agrees with it in all other respects.

thwaitesi, Moore ..... 1.
agni, de Nicéville ..... 2.

This genus appears to be closely allied to the Australian genus *Netrocoryne*.

Confined to the Oriental region.

32. Genus Netrocoryne.

Netrocoryne, Felder, Reise Novara, p. 507 (1867).

Type, *repanda*, Felder.

Antennæ: club rather robust, with a short terminal crook bent at about right angles, tip acuminate. Palpi porrect, rather conspicuous; second joint long, third joint short, bluntly pointed. Fore wing: apex truncate; outer margin sinuate, almost half as long again as inner margin; male with a costal fold; cell less than two-thirds the length of costa; vein 12 reaching costa almost opposite the end of cell: discocellulars inwardly oblique and in the same straight line, the lower considerably the longer; vein 3 well before the end of cell: vein 2 twice as far from end of cell as from base of wing. Hind wing: outer margin sinuate, produced at vein 3, giving a squared appearance to the wing; vein 7 shortly before end of cell; discocellulars and vein 5 traceable but not developed; vein 3 immediately before end of cell; vein 2 twice as far from base of wing as from end of cell. Hind tibiæ with a long fringe and with two pairs of spurs, the upper pair minute.

repanda, Felder.

According to the description and figure in Scott's 'Australian Lepidoptera' (vol. ii. pt. 2, 1891), there is a long tuft of hairs attached to the proximal end of the hind tibiæ, which are otherwise almost naked; this, however, is certainly not the case in some seven males in the collection of the British Museum, in which there is no tuft on the hind tibiæ, but they are clothed with a long fringe for their entire length; there is, however, a short tuft of hair attached to the proximal end of the hind femora.

This genus is confined to Australia.

33. Genus Odontoptilum.

Odontoptilum, de Nicéville, Journ. Bomb. Nat. Hist. Soc. vol. v. p. 217 (1890).

Type, *sura*, Moore.

Antennæ less than half the length of costa; club rather robust, bent at about right angles, tip blunt. Palpi porrect; third joint short, obtusely conical. Fore wing: costa much arched; apex truncate; inner and outer margins subequal; cell less than two-thirds the length of costa; no costal fold in male; vein 12 reaching costa well before the end of cell; discocellulars inwardly oblique, in the same straight line, the lower the longer; vein 3 well before end of cell; vein 2 slightly nearer to base of wing than to vein 3. Hind wing: outer margin with a tooth-like projection between veins 6 and 7; vein 7 well before end of cell; discocellulars and vein 5 distinctly traceable but not fully developed; vein 3 immediately before end of

cell; vein 2 only slightly nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs. Male with a dense recumbent tuft of hairs attached to the proximal end of the fore coxæ.

The species *pygela* differs from the type in having a second tooth-like projection at the extremity of vein 4.

{*angulata*, Felder ... 1.
{*sura*, Moore.
helias, Felder ..... 2.
**pygela*, Hew. ..... 3.
**leptogramma*, Hew. . 4.

Helias, Felder, is a quite distinct species from *sura*, with which it has been confused. This genus has little in common with either *Achlyodes* or *Antigonus*, with which it has been associated.

Confined to Asia.

34. Genus Caprona. (Plates I. fig. 12; III. fig. 15.)

Caprona, Wallgr. Rhop. Caffr. p. 51 (1857).

Type, *pillaana*, Wallgr.

Abaratha, Moore, Lep. Ceyl. vol. i. p. 181 (1881).

Type, *ransonnetii*, Moore.

Antennæ less than half the length of costa; club rather robust, abruptly thickened, and bent at about a right angle, tip blunt. Palpi porrect; second joint thickly scaled, third joint short; almost concealed. Fore wing: apex slightly truncate; cell less than two-thirds the length of costa; discocellulars inwardly oblique, the lower the longer, more oblique, and slightly arched; vein 3 shortly before end of cell; vein 2 only slightly nearer to base of the wing than to 3. Hind wing: outer margin sinuate, produced at vein 2, giving the wing a squared appearance; discocellulars and vein 5 barely traceable; vein 3 shortly before end of cell; vein 2 much further from base of wing than from end of cell. Hind tibiæ with two pairs of spurs. Male with a radiating tuft of hairs attached to fore coxæ.

The species *canopus* differs considerably from the type, the cell of fore wing being broader, the discocellulars less oblique, the apex very truncate, and the outer margin of hind wing much more irregular. The male also wants the tuft of hair on the fore coxæ. The Asiatic species, however, agree entirely with the type.

The genus *Abaratha* must sink as a synonym of *Caprona*, there being no perceptible structural differences between the types.

pillaana, Wallgr. ..... 1.
canopus, Trim. ..... 2.
{*ransonnetii*, Moore ..... 3.
{**potiphera*, Hew.
{*taylorii*, de Nicév.
saraya, Doherty ..... 4.
erosula, Felder ..... 5.
syrichthus, Felder ..... 6.

And one unidentified species.

This genus is closely allied to *Odontoptilum*.

Asiatic and African.

35. Genus Leucochitonea.

Leucochitonea, Wallgr. Rhop. Caffr. p. 52 (1857).

Type, *levubu*, Wallgr.

Antennæ less than half the length of costa; club moderate, less robust than in *Abantis*, recurved, tip blunt. Palpi porrect; second joint short; third joint long, slender, bluntly pointed. Fore wing: inner and outer margins subequal; no costal fold in male; cell less than two-thirds the length of costa; vein 12 reaching costa well before the end of cell; discocellulars inwardly oblique, the lower the longer; vein 3 shortly before end of cell; vein 2 only slightly nearer to base of wing than to vein 3; lower margin of cell arched between veins 2 and 3. Hind wing not conspicuously elongated; outer margin slightly sinuate; vein 7 shortly before end of cell; discocellulars and vein 5 barely traceable; vein 3 immediately before end of cell; vein 2 considerably nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs, the terminal pair considerably the longer. In the male there is a conspicuous tuft of radiating hairs affixed to the fore coxæ. Female with a dense tuft of closely set hairs at extremity of abdomen.

Trimen considers this genus identical with *Abantis*, and that the differences between the two genera pointed out by him are not sufficient for generic separation. The type is the only known species of the genus; the numerous New-World species put in the genus by various authors in no way belong to it.

levubu, Wallgr.

Confined to Africa.

36. Genus Abantis. (Plate III. fig. 16.)

Abantis, Hopff. Verh. Akad. Wiss. Berl. p. 643 (1855).

Type, *tettensis*, Hopff.

Sapæa, Plötz, Stett. ent. Zeit. vol. xl. p. 177 (1879).

Type, *bicolor*, Trim.

Antennæ short, less than half the length of costa; club robust, sharply recurved, tip blunt. Palpi porrect; third joint short, obtusely conical. Fore wing: inner and outer margins subequal; no costal fold in male; cell less than two-thirds the length of costa; vein 12 reaching costa well before the end of cell; discocellulars strongly inwardly oblique, the lower the longer; vein 3 immediately before end of cell; vein 2 slightly nearer to base of wing than to end of cell. Hind wing rather elongated, less conspicuously in the female; outer margin slightly excavated at vein 5; vein 7 shortly before end of cell; discocellulars outwardly oblique; vein 5 traceable but not fully developed; vein 3 immediately before end of cell; vein 2 nearer to end of cell than to base of wing. Hind tibiæ fringed and with two pairs of spurs, the upper pair minute.

tettensis, Hopff. ..... 1.
bicolor, Trim. ..... 2.
paradisea, Butl. ..... 3.

Trimen notes that the epiphysis on the fore tibiæ appears to be

occasionally wanting in *tettensis*. In the only two specimens (both males) in the British Museum the epiphysis is very small, if not absent, but it is impossible to say with certainty without "clearing" the fore leg.

Confined to Africa.

37. Genus Heliopetes.

Heliopetes, Billb. Enum. Ins. p. 81 (1820). Type, *arsalte*, Linn.
Leucoscirtes, Scudd. Syst. Rev. p. 52 (1872).
Type, *ericetorum*, Boisd.

Antennæ: club moderate, blunt, slightly curved. Palpi porrect; second joint laxly clothed with long scales; third joint slender, bluntly conical. Fore wing: inner and outer margins subequal; cell of fore wing less than two-thirds the length of costa; vein 12 reaching costa well before the end of cell; discocellulars suberect, the lower the longer; vein 3 close to end of cell, more than three times as far from 2 as from 4; vein 2 three times as far from end of cell as from base of wing. Hind wing evenly rounded; vein 7 shortly before end of cell; discocellulars and vein 5 very faint; vein 3 immediately before end of cell; vein 2 nearer to base of wing than to end of cell.

Male with a costal fold and with a tuft of hairs attached near proximal end of hind tibiæ.

domicella, Erich. ..... 1.
**locutia*, Hew. ..... 2.
**laviana*, Hew. ..... 3.
ericetorum, Boisd. ..... 4.
omrina, Butl. ..... 5.
arsalte, Linn. / *niveus*, Cram. ..... 6.
figura, Butler ..... 7.
petrus, Hübn. / **laginia*, Hew. ..... 8.
**leucola*, Hew. ..... 9.
alarna, Reak. ..... 10.

And three unidentified species.

Confined to tropical America.

38. Genus Hesperia. (Plates I. fig. 11; III. fig. 19.)

Hesperia, Fabr. Ent. Syst. iii. vol. i. p. 258 (1793).
Type, *malvæ*, Linn.
Pyrgus, Hübn. Verz. p. 109 (1816). Type, *syrichtus*, Fabr.
Scelothrix, Ramb. Cat. Lép. Andal. i. p. 63 (1858).
Type, *carthami*, Hübn.
Syrichtus, Boisd. Icones, p. 230 (1832–33). Name sinks, being derived from species in genus.

Antennæ: club robust, arcuate, blunt at the tip, no terminal crook. Palpi suberect; second joint laxly clothed with longish scales; third joint slender, blunt, almost concealed in scaling of second joint. Fore wing: inner and outer margins subequal; cell less than two-thirds the length of costa; vein 12 reaching costa well before the end of cell; discocellulars suberect, the lower the longer; vein 3 shortly before end of cell, more than twice as far from 2 as from 4; vein 2 nearer base of wing than to end of cell. Hind wing usually evenly rounded, occasionally slightly crenulate; vein 7 very shortly before end of cell; discocellulars and vein 5 very faint; vein 3

immediately before end of cell; vein 2 nearly equidistant from base of wing and end of cell. Hind tibiæ with two pairs of spurs.

This genus may be conveniently divided into groups on the male secondary sexual characters.

Section A.—Male without costal fold and without tuft of hairs on hind tibiæ.

spio, Linnæus ..... 1.
sataspes, Trimen ..... 2.
**zebra*, Butler ..... 3.
hellas, de Nicéville.
galba, Fabr. ..... 4.
**superna*, Moore.
**evanidus*, Butler ..... 5.
*var. *adenensis*, Butler.
diomus, Hopff. ..... 6.
asterodia, Trim. ..... 7.
dromus, Plötz ..... 8.
vindex, Cram. ..... 9.
transvaaliæ, Trim. ..... 10.
orbifer, Latr. ..... 11.
sao, Bergstr. ..... 12.
var. *therapne*, Rbr.
phlomides, H.-S. ..... 13.
**geron*, n. sp. ..... 14.

The above group includes all the African, most of the Asiatic, and a few of the European species of the genus, and is not found in the New World.

Section B.—Male with a costal fold; no tuft of hairs on the hind tibiæ, but with these tibiæ furnished with numerous short spines.

cribrellum, Evers. ..... 15.

Section C.—Male with a costal fold, but with no tuft of hairs on hind tibiæ.

tessellum, Hübn. ..... 16.
gigas, Brem. ..... 17.
nomas, Led. ..... 18.
poggei, Led. ..... 19.
proto, Esp. ..... 20.
americanus, Blanch. ... 21.
syrichtus, Fabr. ..... 22.
orcus, Cram.
montivagus, Reak. ..... 23.
tessellata, Scud.
communis, Grote.

This group is confined to the New World, Europe, and Central Asia. There is a single male of *H. poggei* in the British Museum obtained by the writer at Quetta, Biluchistan; but this is the only species which ranges into the Indian region. The specimen above referred to, though agreeing best with *poggei* on the upperside, appears nearer to *proto* in size and in the markings of the underside.

Section D.—Male with a costal fold and with a tuft of hairs on hind tibiæ.

cashmirensis, Moore ..... 24.
cacaliæ, Ramb. ..... 25.
serratulæ, Ramb. ..... 26.
var. *cæcus*, Freyer.
alveus, Hübn. ..... 27.
var. *onopordi*, Ramb.
var. *carlinæ*, Ramb.
var. *cirsii*, Ramb.
andromeda, Wallgr. ..... 28.
centaureæ, Ramb. ..... 29.
wyandot, Edw.
hypoleucos, Led. ..... 30.
malvæ, Linn. ..... 31.
ab. *taras*, Meig.
cynaræ, Ramb. ..... 32.
carthami, Hübn. ..... 33.
var. *maschleri*, H.-S.
sidæ, Esp. ..... 34.
antonia, Spey. ..... 35.
**sinicus*, Butl. ..... 36.
maculatus, Brem. ..... 37.
**bocchoris*, Hew. ..... 38.
**fulvovittatus*, Butl. ..... 39.
trisignatus, Mab. ..... 40.
asychis, Godt. ..... 41.

This group occurs in Europe, Asia, and the New World.

All the species of this genus in which the male has a tuft of hairs on the hind tibiæ also are provided with a "pair of scabbard-shaped scaly and hairy appendages, springing posteriorly from the breast at the base of the hind legs and about one third the length of the abdomen." These appendages will be found to be present in the males of all genera which are provided with tufts on the hind tibiæ, and when the hind legs are drawn up the tuft is inserted between the appendage and the base of the abdomen.

This is a genus which needs splitting up; but a further knowledge of the earlier stages is necessary to do it satisfactorily.

HESPERIA GERON, sp. nov.

Upperside dark brown, almost black, spotted with white. Fore wing with a few grey scales at base of wing and along inner margin; a longitudinal white spot at base of cell, a broad square spot extending across the centre of cell, and a crescent-shaped spot closing cell; an oval spot on submedian; a submarginal row of eight white spots across wing beyond cell, the upper four coalescing, the first three large, the fourth small, the fifth triangular, equal in size to and immediately below the fourth, the sixth square, twice the size of the fifth, nearer the base of the wing, the seventh and eighth rectangular, almost equal in size, larger and nearer to the base of the wing than the sixth, the eighth placed immediately below the seventh, which is immediately below the crescent-shaped spot closing cell; a marginal row of eight white dots. Hind wing with a large rounded spot closing cell and three more spots coalescing with it and with each other extending towards the inner margin as far as the submedian; a small spot at base of cell and a marginal row of six white dots; inner margin clothed with long whitish hairs; all above spots white. Cilia of both wings chequered. Underside: fore wing as above, the costal margin and apex suffused with greenish white; hind wing: ground-colour ochraceous yellow; spots as above, but with an additional large spot in the marginal row, situated at the apex of the wing, and an extra spot in the discal row situated between the costal and subcostal nervures just above the subcostal bifurcation. Thorax and abdomen above black; last few segments of abdomen whitish. Palpi and abdomen beneath greyish white. Antennæ: shaft grey above, white beneath; club black, tip white.

Expanse 31 millim.

Nearest to *H. phlomidis*, H.-S., from which it differs in its smaller size, more extended white markings on the fore wing above, but chiefly in the colour and markings on the underside of the hind wing; in *phlomidis* the ground-colour is sap-green, in *geron* ochraceous yellow: in the former the large spot above the subcostal bifurcation unites with the discal row and also is broadly diffused above the costal nervure along the costa to the base; in the latter the large spot above the subcostal bifurcation is well separated from the spot at end of cell and does not extend above the costal nervure.

Described from six specimens collected by me at Quetta, Biluchistan, in June. There is also a single specimen in the collection

of the British Museum from Shahrud, Persia, labelled with the manuscript name of *geron*, Zeller, which name I have therefore adopted.

39. Genus Gomalia.

Gomalia, Moore, P. Z. S. 1879, p. 114.
Type, *albofasciata*, Moore.

Antennæ and palpi as in *Hesperia*, except that the club of antennæ is slender and straight. Male with a costal fold. Differs from *Hesperia* in neuration only in vein 2 being slightly nearer the base of the fore wing. Hind tibiæ with two pairs of spurs; but with no tuft in the male.

albofasciata, Moore.
**litoralis*, Swinhoe.
elma, Trimen.

And one unnamed species. *Elma* is very close to *albofasciata*; but the series in the British Museum is not sufficient to decide whether they are identical.

Asiatic and African.

40. Genus Carcharodus.

[*Urbanus*, Hübner, Tentamen, p. 1 (1806).]
Type, *alceæ*, Esp.

Carcharodus, Hübner, Verz. p. 110 (1816).
Type, *lavateræ*, Esp.

Spilothyrus, Dup. Pap. France, Diurn. Suppl. p. 415 (1832).
Type, *alceæ*, Esp.

Antennæ: club rather robust, straight, with an extremely minute blunt crook. Palpi suberect; third joint rather prominent; second joint rather laxly scaled. Fore wing: inner and outer margins subequal; male with a costal fold; cell of fore wing less than two-thirds the length of costa; vein 12 reaching costa well before the end of cell; discocellulars suberect, the lower the longer; vein 3 shortly before the end of cell, twice as far from 2 as from 4; vein 2 twice as far from end of cell as from base of wing. Hind wing: outer margin crenulate; vein 7 more than twice as far from 8 as from 6; discocellulars and vein 5 faint; vein 3 well before end of cell; vein 2 distinctly nearer to base of wing than to end of cell. Hind tibiæ fringed, and with two pairs of spines, the upper pair minute.

This genus can be conveniently divided into two groups, in one of which the male has a tuft of hairs on the underside of the fore wing which is wanting in the other.

Section A.—No tuft of hairs on underside of fore wing in male.

lavateræ, Esp. ..... 1.
alceæ, Esp. ..... 2.
malvarum, Hoffm.
malvæ, Hufn.
malvæ, Hübn.

**alceæ*, var. *nostras*, Zell. . 2 *a*.
**alceæ*, var. *australis*, Zell. 2 *b*.
**swinhoei*, sp. n. ..... 3.

Section B.—Male with a tuft of hairs at base of fore wing on underside.

altheæ, Hübn. ..... 4.
gemina, Led.

altheæ, var. *bæticus*, Rbr. . 4 *a*.
altheæ, var. *marrubii*, Rbr.
dravira, Moore ..... 5.

As the publication of the 'Tentamen' is more than doubtful, the generic name *Urbanus* is ignored.

Range. Europe, Asia, and Africa.

CARCHARODUS SWINHOEI, sp. nov.

Closely allied to *alceæ*, Esp., of which it is probably a local race. On the upperside it differs in its much more olive-green tone, being entirely without the red suffusion which is invariably present in *alceæ* and its two varieties *australis*, Zeller, and *nostras*, Zeller. On the fore wing the transparent spots are much more conspicuous, and on the hind wing the pale markings of the underside show through much more conspicuously. The dark markings of the fore wing also show up much less conspicuously, the whole being more uniform in colour. On the underside the colouring is considerably colder in tone, lacking the warm-brown suffusion of *alceæ* and its varieties, being irrorated instead with greenish grey.

Expanse 28 millim.

There are numerous specimens of this species in the British Museum from Biluchistan, Afghanistan, and Thundiani, N.W. India.

This species has hitherto been identified as *altheæ*, Ramb., var. *marrubii*, Ramb., which, however, belongs to a different section of the genus, in which the male is furnished with a tuft of hairs on the underside of the fore wing. The only other species of the genus occurring within Indian limits is *dravira*, Moore, which belongs to the *altheæ* group of the genus.

41. Genus PHOLISORA.

Pholisora, Scudder, Syst. Rev. Am. Butt. p. 51 (1872).
Type, *catullus*, Fabr.

Pholisora, Scudder, Butt. New England, p. 1514 (1889).

Antennæ: club very gradually thickened, bent at a little more than a right angle, tip blunt. Palpi porrect; second joint loosely scaled; third joint slender, rather conspicuous, bluntly conical. Fore wing: inner margin considerably longer than outer margin; cell less than two-thirds the length of fore wing; male with a costal fold; discocellulars suberect, the lower the longer; vein 3 immediately before the end of cell, many times further from 2 than from 4; vein 2 close to base of wing. Hind wing: vein 7 shortly before end of cell; discocellulars and vein 5 very faint; vein 3 immediately before the end of cell; vein 2 slightly nearer to base of wing than to end of cell. Hind tibiæ with two pairs of spurs.

catullus, Fabr. ..... 1.
hayburstii, Edw. ..... 2.

velasquez, Luc. ..... 3.
chlorocephala, Latr. ..... 4.

And seven unidentified species.

Confined to America.

42. Genus Thanaos.

Thanaos, Boisd. Icones, 240 (1832–1833). Type, *tages*, Linn.

Antennæ: club moderate, more or less bent into a curve, bluntly pointed. Palpi porrect; second joint laxly clothed; third joint almost concealed, bluntly conical. Fore wing: inner margin longer than outer margin; male with a costal fold; cell of fore wing less than two-thirds the length of costa; discocellulars slightly inwardly oblique, the lower the longer; vein 3 shortly before the end of cell; vein 2 slightly nearer to base of wing than to end of cell. Hind wing: outer margin evenly rounded; vein 7 very close to end of cell; discocellulars and vein 5 faint; vein 3 immediately before end of cell; vein 2 almost equidistant from end of cell and base of wing. Hind tibiæ fringed and with two pairs of spines, the upper pair minute.

This genus as it stands at present includes many species which are certainly not congeneric. The above description is taken from the type species.

tages, Linn. ..... 1.
var. *cervantes*, Grasl.
lucilius, Linn. ..... 2.
persius, Sc. ..... 3.
martialis, Sc. ..... 4.
icelus, Lint. ..... 5.
brizo, Boisd. ..... 6.
juvenalis, Fabr. ..... 7.
funeralis, Sc. ..... 8.
tristis, Boisd. ..... 9.
nævius, Lint. ..... 10.
propertius, Sc. ..... 11.
montana, Brem. ..... 12.
rusticanus, Butl.

Found in Europe and North America.

Subfamily III. Pamphilinæ.

Section A.

Antennæ very varied, never much hooked, and usually sharply pointed. In all the genera in which the tip of the antennæ is blunt the epiphysis on the fore tibia is wanting, excepting in one or two Australian forms.

Palpi: third joint usually short and inconspicuous, in some few genera long and slender; in these it is also always erect and never porrected horizontally in front of the face.

Fore wing: cell always less than two-thirds the length of costa; vein 5 slightly nearer to 4 than to 6, except in some aberrant Australian forms, in which it is slightly nearer to 6. Hind wing never with a conspicuous tail or tooth, though frequently more or less lobate; vein 5 never well developed.

Male never with a costal fold and only comparatively seldom with a discal stigma on the fore wing; frequently with glandular patches and tufts of hair on the wings; never with a tuft on the hind tibiæ.

The epiphysis on the fore tibiæ and the medial pair of spurs on the hind tibiæ are occasionally wanting.

Confined almost entirely to the Old World. As far as is known the species of this group rest with their wings raised over their backs, assuming that position immediately on settling.

Section B.

Antennæ very varied, but never hooked; the club either entirely without, or with a crook of varying length. Palpi: third joint in several genera long, slender, and curving over the vertex, a character never found in the *Hesperiinæ*; in most of the other genera the third joint is minute, only very rarely being horizontally porrected, and when this is the case it is always stout.

Fore wing: cell invariably less than two-thirds the length of costa; vein 5 curves downwards at its base and consequently arises considerably nearer to 4 than to 6; the middle discocellular being considerably longer than the lower one, frequently more than twice as long as it. Hind wing usually rather elongate, but never with a conspicuous tail or tooth; vein 5 very rarely developed.

The male is frequently furnished with a discal stigma on the fore wing and never with a costal fold. Both pairs of spurs are invariably present on the hind tibiæ, and there is never a tuft of hair on the tibiæ in the male. The epiphysis on the fore tibiæ is invariably present.

This group is of world-wide distribution; the South-American forms, however, are comparatively few.

The majority of the species when sunning on a leaf depress their hind wings and elevate their fore wings, an attitude peculiar to this section. When in a complete state of repose both the wings are raised till they meet over their backs.

Section C.

Antennæ: club of varying robustness, always tapering to a fine point; occasionally hooked, in which case the terminal portion is always more than half the length of remainder of club. Palpi: second joint upturned, pressed closely against the face; third joint long, slender, naked, porrect, projecting horizontally in front of the face. Cell of fore wing ranging from just over one-half to just over two-thirds the length of costa. Hind wing more or less lobate; vein 5 of hind wing usually well developed; vein 5 of fore wing equidistant from 4 and 6 or slightly nearer to 6.

Male never with a costal fold on fore wing, but with various other secondary sexual characters, both on wings and legs.

As far as is known, all the species rest with their wings raised above their backs, frequently settling on the underside of leaves. They are remarkably crepuscular in their habits, being specially active only in the very early morning and at dusk. The section is confined entirely to the Old World.

The palpi of this section are very distinct, and readily separate them from nearly all other genera. The few genera of *Hesperiinæ* (*Phanus*, *Entheus*, and allies) which have somewhat similar palpi differ in the entirely different form of antennæ, in the constant absence of vein 5 of the hind wing, and in some cases by the presence of the costal fold of the fore wing.

Synopsis of Genera of PAMPHILINÆ.

Section A.

**a*. Vein 5 of fore wing slightly nearer to 6 than to 4.
  a^1. Tip of antennæ blunt. MOTASINGHA, g. n. Type, *dirphia*, Hew. (1)
  b^1. Tip of antennæ acuminate.
    a^2. Club of antennæ arcuate, with no distinct terminal crook.
      TELESTO, Boisd. Type, *perronii*, Latr. (2)
    b^2. Club of antennæ with a distinct terminal crook.
      a^3. Male with a discal stigma on fore wing.
        HESPERILLA, Hew. Type, *ornata*, Leach. (3)
      b^3. No discal stigma on fore wing of male.
        a^4. Antennal crook short.
          PATLASINGHA, g. n. Type, *phigalia*, Hew. (4)
        b^4. Antennal crook long.
          TRAPEZITES, Hübn. Type, *symmonus*, Hübn. (5)

b. Vein 5 of fore wing not nearer to 6 than to 4, usually distinctly nearer to 4 than to 6.
  a^1. Epiphysis on fore tibiæ present.
    a^2. Third joint of palpi long, slender, erect, curving over the vertex.
      a^3. Vein 2 of hind wing considerably nearer to end of cell than to base of wing.
        a^4. Vein 11 of fore wing not touching vein 12.
          a^5. Vein 3 of fore wing well before the end of cell, and vein 3 of hind wing from before end of cell.
            a^6. Vein 2 of fore wing nearer to base of wing than to end of cell. SUASTUS, Moore. Type, *gremius*, Fabr. (6)
            b^6. Vein 2 of fore wing nearer to end of cell than to base of wing. ACLEROS, Mab. Type, *leucopyga*, Mab. (7)
          b^5. Vein 3 of fore wing immediately before end of cell and vein 3 of hind wing from end of cell.
            IAMBRIX, g. n. Type, *salsala*, Moore. (8)
        b^4. Vein 11 of fore wing touching vein 12 for a portion of its length. KORUTHIALOS, g. n. Type, *hector*, sp. n. (9)
      b^3. Vein 2 of hind wing not nearer to end of cell than to base of wing.
        a^4. Fore wing produced apically.
          OXYPALPUS, g. n. Type, *iguita*, Mab. (10)
        b^4. Fore wing not produced apically.
          TEINORHINUS, g. n. Type, *watsoni*, Holl. (11)
    b^2. Terminal joint of palpi short and inconspicuous.
      a^3. Vein 11 of fore wing free.
        a^4. Veins 2 and 3 of hind wing not swollen in the male.
          a^5. Male with an oval glandular patch on upperside of hind wing. OSMODES, g. n. Type, *laronia*, Hew. (12)
          b^5. No glandular patch on upperside of hind wing in the male.
            a^6. Costa of fore wing straight, slightly excised before apex.
              a^7. Vein 3 of hind wing from before end of cell.
                BUTLERIA, Kirby. Type, *exornatus*, Feld. (13)
              b^7. Vein 3 of hind wing from end of cell.
                AMBLYSCIRTES, Sc. Type, *vialis*, Edw. (14)
            b^6. Costa of fore wing not excised before apex.
              a^7. Vein 2 of fore wing considerably nearer to end of cell than to base of wing.
                a^8. Vein 3 of hind wing from before end of cell.
                  a^9. No tuft of hairs on underside of fore wing in male.
                    AROMACHUS, de Nicé. Type, *stigmata*, Moore. (15)
                  b^9. Male with a tuft of hairs on underside of fore wing. SEBASTONYMA, g. n. Type, *dolopia*, Hew. (16)
                b^8. Vein 3 of hind wing from end of cell.
                  PEDESTES, g. n. Type, *masuriensis*, Moore. (17)

* This group is confined entirely to the Australian region.

b^7. Vein 2 of fore wing not at all or or only slightly nearer to end of cell than to base of wing.
a^8. Small forms. Vein 7 of hind wing considerably nearer to 6 than to 8.
a^9. No discal stigma on fore wing of male.
a^{10}. No glandular streaks on upperside of fore wing in male, and cilia at anal angle of hind wing of normal length. Antennæ moderate.
a^{11}. Fore wing apically produced in male, outer margin very oblique, almost equal to inner margin.
a^{12}. Vein 3 of hind wing from before end of cell.
a^{13}. Third joint of palpi horizontal.
ARNETTA, g. n. Type, *atkinsoni*, Moore. (18)
b^{13}. Third joint of palpi erect.
HYAROTIS, Moore. Type, *adrastus*, Cram. (19)
b^{12}. Vein 3 of hind wing from end of cell.
HYPOLEUCIS, Mab. Type, *tripuncta*, Mab. (20)
b^{11}. Fore wing not produced apically, outer margin hardly oblique, considerably shorter than inner margin.
a^{12}. Third joint of palpi erect.
ISOTEINON, Felder. Type, *lamprospilus*, Feld. (21)
b^{12}. Third joint of palpi horizontal.
ISMA, Distant. Type, *obscura*, Dist. (22)
b^{10}. No glandular streaks on upperside of fore wing in male, but cilia at anal angle of hind wing very much elongated. Antennæ exceptionally long.
LOPHOIDES, g. n. Type, *iapis*, de Nicé. (23)
c^{10}. Male with two pairs of glandular streaks along veins at base of fore wing on upperside.
ZOGRAPHETUS, g. n. Type, *satwa*, de Nicé. (24)
b^9. Male with a linear discal stigma on fore wing.
MATAPA, Moore. Type, *aria*, Moore. (25)
b^8. Large forms. Vein 7 of hind wing almost equidistant from 6 and 8.
ERIONOTA, Mab. Type, *thrax*, Linn. (27)
b^6. Veins 2 and 3 of the hind wing much swollen in the male.
a^7. No discal patch of specialized scales on upperside of fore wing in male. GANGARA, Moore. Type, *thyrsis*, Fabr. (28)
b^7. Male with a discal patch of specialized scales on upperside of fore wing. PADUKA, Dist. Type, *lebadea*, Hew. (26)
b^2. Vein 11 of fore wing touching 12 for a portion of its length.
SANCUS, de Nicé. Type, *subfasciatus*, Moore. (29)
b^1. No epiphysis on fore tibiæ.
a^2. Antennæ moderate, more than half the length of costa.
ARGOPTERON, g. n. Type, *aureipennis*, Blanch. (31)
b^2. Antennæ short, less than half the length of costa.
a^3. Vein 11 of fore wing free.
a^4. Club of antennæ arcuate, tip acuminate.
EUMESIA, Feld. Type, *semiargentea*, Feld. (30)
b^4. Club of antennæ straight, tip blunt.
a^5. Vein 3 of fore wing well before end of cell, vein 2 nearer to base of wing than to end of cell.
HETEROPTERUS, Dum. Type, *morpheus*, Pall. (32)
b^5. Vein 3 of fore wing immediately before the end of cell, vein 2 nearer to end of cell than to base of wing.
PAMPHILA, Fabr. Type, *palæmon*, Pall. (33)
b^3. Vein 11 of fore wing running into 12.
CYCLOPIDES, Hübn. Type, *metis*, Linn. (34)

1. Genus Motasingha, nov. (Plate III. fig. 23.)

Type, *dirphia*, Hew.

Antennæ: club very robust, bent at right angles with shaft, tip blunt. Palpi as in *Telesto*. Fore wing: inner margin slightly longer than outer margin; cell less than two-thirds the length of costa; vein 12 reaching costa shortly before the end of cell; upper discocellular short but distinct, outwardly oblique, middle and lower discocellulars inwardly oblique, the former very faint, the latter well developed; vein 5 slightly nearer to 6 than to 4; vein 3 well before the end of cell, about twice as far from 2 as from 4; vein 2 slightly nearer to end of cell than to base of wing. Hind wing slightly elongated, outer margin even; vein 7 far before the end of cell; discocellulars and vein 5 very faint; veins 1, 2, 3, and 4 all close together, vein 3 nearer to 4 than to 2; lower margin of cell angled slightly at vein 2 and more abruptly at vein 3. Hind tibiæ with two pair of spurs. The female does not differ from the male in neuration.

Male with a linear discal stigma lying almost at right angles to the inner margin, extending from just beyond the lower angle of cell and just below vein 1.

*_dirphia_, Hew.
trimaculata, Tepper. ♂.
quadrimaculata, Tepper. ♀.

Confined to Australia.

2. Genus Telesto. (Plates II. fig. 7; III. fig. 22.)

Telesto, Boisd. Voy. Astrol. 164 (1832). Type, _perronii_, Latr.

Antennæ: club rather robust, arcuate, with no terminal crook, tip acuminate. Palpi porrect; third joint short, obtusely conical. Fore wing rather pointed at apex; outer margin nearly straight; inner margin slightly longer than outer margin; cell less than two-thirds the length of costa; discocellulars inwardly oblique, subequal; vein 5 almost equidistant from 4 and 6, slightly nearer to 6; vein 3 well before end of cell, slightly further from 2 than from 4; vein 2 almost equidistant from end of cell and base of wing. Hind wing slightly elongated, outer margin even; vein 7 equidistant from 6 and 8; discocellulars faint; veins 2, 3, and 4 all close together; vein 3 nearer to 4 than to 2; lower margin of cell bent abruptly upwards at vein 3. Hind tibiæ with two pairs of spurs.

Male with an oblique linear streak on fore wing, extending from just beyond the lower cell almost to the inner margin. The female does not differ perceptibly from the male in neuration.

perronii, Latr.
kochii, Feld.
doclea, Hew.

Confined to Australia.

The following Australian species belong to undescribed genera closely allied to *Telesto*:—

**flammeata*, Butl. ♀. **ecclipsis*, Butl. ♂. *atromaculata*, Miskin. ♂. *doubledayii*, Felder.	*ismene*, Newm. *compacta*, Butl. **argenteo-ornatus*, Hew.

There is absolutely no doubt that the *flammeata* of Butler is the female of the species described by him as *ecclipsis*, though the former has been identified by Miskin as identical with *donnysa*, Hew., a quite distinct species belonging to a different though closely allied genus.

3. Genus Hesperilla.

Hesperilla, Hewitson, Hundred Hesp. p. 37 (1868).

Type, *ornata*, Leach.

Antennæ: club slender, at an angle with the shaft, usually bent to less than a right angle, tip acuminate. Palpi as in *Telesto*. Fore wing: inner margin longer than outer margin; cell less than two-thirds the length of costa; discocellulars inwardly oblique; vein 5 equidistant from 4 and 6 or slightly nearer to 6; vein 3 shortly before end of cell, about twice as far from 2 as from 4; vein 2 considerably nearer to end of cell than to base of wing. Hind wing rather elongate in the male, more rounded in the female; vein 7 well before the end of cell; discocellulars faint; vein 5 not traceable; veins 2, 3, 4 all close together from end of cell; vein 3 twice as far from 2 as from 4; lower margin of cell slightly angled at vein 2, abruptly at vein 3. Hind tibiæ with two pairs of spurs, upper pair minute.

Male with a linear discal stigma on the fore wing, lying almost at right angles to the inner margin, extending from just beyond the lower angle of cell as far as but not below vein 1.

ornata, Leach..... 1.
picta, Leach..... 2.

Confined to Australia.

The following Australian species belong to undescribed genera closely allied to *Hesperilla*:—

**donnysa*, Hew.
**halyzia*, Hew.

4. Genus Patlasingha, nov.

Type, *phigalia*, Hew.

Antennæ: club rather robust, with a short terminal crook; tip acuminate. Palpi as in *Telesto*. Fore wing: inner margin longer than outer margin; cell less than two-thirds the length of costa; vein 12 reaching costa before the end of cell; discocellulars slightly inwardly oblique; vein 5 practically equidistant from 4 and 6; vein 3 shortly before end of cell; vein 2 almost equidistant from base of wing and end of cell. Hind wing evenly rounded; vein 7 well before the end of cell; discocellulars and vein 5 very faint; veins

2, 3, and 4 all close together; vein 3 equidistant from 2 and 4; lower margin of cell abruptly bent upwards at vein 13. Hind tibiæ with two pairs of spurs.

No secondary sexual characters on wings of male.

**phigalia*, Hew. ..... 1.
**petalia*, Hew. ..... 2.
lutea, Trepper ..... 3.
**scepticalis*, Rosen. ..... 4.
**maheta*, Hew. ..... 5.

Miskin has sunk *maheta* as a synonym of *iacchus*, Fabr., a quite distinct species belonging to a different genus; he has also sunk *utea* as a synonym of *petalia*, though the two species seem quite distinct; and he has further sunk *scepticalis* as a synonym of *compacta*, Butl., though it would be difficult to imagine two species more dissimilar. This genus is confined to Australia.

5. Genus Trapezites.

Trapezites, Hübn. Verz. p. 112 (1816). Type, *symmonus*, Hübn.

Antennæ: club robust, elongate, with a long slender terminal crook. Palpi: second joint densely scaled, third joint minute. Fore wing: inner and outer margins subequal; cell less than two-thirds length of costa; vein 12 reaching costa before the end of cell; discocellulars slightly inwardly oblique; vein 5 almost equidistant from 4 and 6; vein 3 well before the end of cell; vein 2 more than twice as far from end of cell as from base of wing. Hind wing: outer margin even; vein 7 well before end of cell, almost equidistant from 6 and 8; discocellulars and vein 5 barely traceable; veins 2, 3, and 4 all close together, vein 3 almost equidistant from 2 and 4; lower margin of hind wing bent upwards at vein 2.

symmonus, Hübn. ..... 1.
iacchus, Fabr. ..... 2.
**clicna*, Hew.

Confined to Australia.

6. Genus Suastus.

Suastus, Moore, Lep. Ceyl. vol. i. p. 168 (1881). Type, *gremius*, Fabr.

Antennæ: club moderate, elongate, with a short recurved crook; tip acuminate. Palpi erect; third joint long, slender, acuminate, curving backwards, reaching well above the vertex. Fore wing: inner and outer margins subequal; cell less than two-thirds the length of costa; vein 12 reaching costa well before the end of cell; discocellulars subequal, the middle one a little the longer; vein 5 slightly nearer to vein 4 than to vein 6; vein 3 well before the end of cell, more than twice as far from 2 as from 4; vein 2 considerably nearer to base of wing than to end of cell, in female almost equidistant from end of cell and from base of wing. Hind wing: outer margin evenly rounded; vein 7 shortly before the end of cell discocellulars very faint; vein 5 not traceable; vein 3 shortly before end of cell; vein 2 considerably nearer to end of cell than to base

of wing; lower margin of cell not angled at veins 2 or 3. Hind tibiæ with two pairs of spurs.

gremius, Fabr. ..... 1.	*swerga*, de Nicév. ..... 4.
divodasa, Moore.	*möllori*, Moore.
subgrisea, Moore.	*minuta*, Moore ..... 5.
sala, How. ..... 2.	*bipunctus*, Swinh. ..... 6.
aditus, Moore ..... 3.	

The male of *gremius* has been redescribed by Moore as *subgrisea*.
Confined to Southern Asia.

7. Genus Acleros.

Acleros, Mab. Lep. Mad. i. p. 347 (1887).

Type, *leucopyga*, Mab.

Closely allied to *Suastus*, with which it agrees in antennæ and palpi; it differs, however, considerably in neuration, vein 2 of the fore wing being nearer to the end of the cell than to the base of the wing. In the hind wing also the cell is longer, and vein 3 is well before the end of the cell instead of immediately before, as in *Suastus*.

No secondary sexual characters in the male.

Two unidentified species from West Africa.

8. Genus Iambrix, nov. (Plate III. fig. 25.)

Type, *salsala*, Moore.

Antennæ rather short; club moderate, gradually thickened, bent at rather more than a right angle; terminal portion short. Palpi: second joint densely clothed; third joint long, naked, slender, and erect. Wings short and broad; cell short; middle and lower disco-cellulars in the same straight line; vein 5 only slightly nearer to 4 than to 6; vein 3 very close to end of cell; vein 2 nearer to end of cell than to base of wing. Hind wing: vein 3 from end of cell; vein 7 from before end of cell; vein 5 wanting; discocellulars barely traceable. Hind tibiæ with two pairs of spurs.

No secondary sexual characters in male.

salsala, Moore ..... 1.
**stellifer*, Butler ..... 2.
sindu, Felder ..... 3.

Stellifer is quite distinct from *salsala*, with which it has been said to be synonymous. It is smaller and darker, and is entirely without the golden yellow scales on the upperside which are characteristic of *salsala*.

It is apparently confined to Malacca and Burmah, the specimens recorded from various parts of India being an unmarked and not uncommon variety of *salsala*.

Confined to Southern Asia.

9. Genus Koruthaialos, nov. (Plate II. fig. 8.)

Type, *hector*, Watson.

Antennæ moderate, club hardly thicker than shaft. Palpi similar

to those of *Iambrix*, but the third joint is shorter. Shape of wings much as in *Iambrix*, but the costa of fore wing is more arched; vein 3 well before end of cell; vein 2 about equidistant from end of cell and base of wing; vein 5 about equidistant from 4 and 6; upper discocellular minute; vein 11 starting about halfway between base of wing and end of cell, almost exactly opposite vein 2, strongly deflected upwards soon after its origin, and touching vein 12 for a short distance. Hind wing: vein 3 immediately before end of cell; vein 2 about twice as far from base of wing as from end of cell; vein 7 shortly before end of cell; discocellulars oarely traceable: vein 5 wanting.

Male with a bristly tuft of hairs, springing from the base of the costa of the hind wing; there being also a distinct groove on the underside of the fore wing below the subcostal nervure to receive the tuft of hairs when the wings are closed.

This genus is closely allied to *Astictopterus*, *Iambrix*, and *Sancus*, in the last of which vein 11 also touches vein 12 for a short distance; the only other genus in which at all a similar character obtains is *Cyclopides*, but in this genus veins 11 and 12 altogether anastomose and run confluent for the rest of their course.

hector, sp. n.	1.
xanites, Butler	2.
butleri, Wood-Mason and de Nicéville ...	3.

And two unnamed species.
Confined to Southern Asia.

KORUTHAIALOS HECTOR, sp. nov.

Astictopterus xanites auctorum, *nec* Butler.

Above dark fuscous. Fore wing with an orange-red fascia crossing the wing at the end of the cell, not reaching either the costal or inner margins. Hind wing without markings. Wings beneath as above; the fascia on the fore wings being broader than above, and extending from close to the costa up to or slightly beyond the first median branch.

The fascia on the fore wing varies considerably in extent, especially on the upperside, but on the underside never reaches the submedian and is never diffused along the inner margin as in *xanites*.

Expanse 35 millim. (*xanites* expands 41 millim.).

Occurs throughout Burmah and Malacca, and also in Java.

This species has hitherto been confused with *xanites*, Butler; but the latter differs considerably on the underside of the fore wing, the orange fascia extending broadly as far as the outer angle and spreading along the outer half of the inner margin. *Xanites* appears to be a rare species, the only specimens I have seen being the type from Borneo and a single specimen from Malacca; this is apparently the species figured by Distant [1] as *gemmifer*, the gem-like spots of the true *gemmifer* (which is a *Kerana*) being omitted both from his figure and description. The species figured by Distant as *xanites* is the species here described as *hector*.

[1] Rhop. Mal. pl. xxxiv.

10. Genus Oxypalpus, nov.

Type; *ignita*, Mab.

Antennæ: club moderate, elongate, with a short terminal crook. Palpi widely separated, third joint very long and slender, erect, curving over the vertex; tip acuminate. Fore wing: costa straight; apex slightly acute; inner and outer margins subequal; cell less than two-thirds the length of costa; vein 5 only slightly nearer to 4 than to 6; vein 3 immediately before end of cell; vein 2 almost equidistant from end of cell and base of wing. Hind wing evenly rounded; discocellulars and vein 5 not traceable; vein 7 close to end of cell. In the male vein 3 is given off far beyond the end of cell, there being a glandular thickening of the median just before the origin of vein 3; the glandular opening being on the upperside, where it is partially concealed by a tuft of hairs, attached to the upper margin of cell and directed outwards; vein 2 almost equidistant from base of wing and vein 3. In the female vein 3 of the hind wing is given out immediately before the end of the cell. Hind tibiæ with two pairs of spurs.

ignita, Mab. ♂.
gisgon, Mab. ♀.

And two unidentified species.
Confined to the African region.

11. Genus Teinorhinus, nov.

Type, *watsoni*, Holland.

Antennæ: club slender; apical crook short; tip acuminate. Palpi widely separated; third joint very long and slender, erect, curving over the vertex. Fore wing short and broad; costa convex; outer margin convex; apex rounded; cell less than two-thirds length of costa; vein 12 reaching costa well before the end of cell; vein 2 almost equidistant from vein 3 and base of wing. Hind wing: outer margin even; vein 7 shortly before the end of cell; discocellulars and vein 5 barely traceable; vein 3 immediately before the end of cell; vein 2 almost equidistant from end of cell and base of wing. Hind tibiæ with two pairs of spurs.
No sexual characters on wings of male.

watsoni, Holland.

Confined to the African region.

12. Genus Osmodes, nov.

Type, *laronia*, Hew.

Antennæ: club elongate, with a short terminal crook. Palpi: second joint densely clothed, third joint minute. Fore wing slightly produced apically; inner and outer margins subequal, inner margin very convex in the male, straight in the female; cell less than two-thirds the length of costa; vein 5 slightly nearer to 4 than to 6;

vein 3 shortly before the end of cell; vein 2 almost equidistant from vein 3 and base of wing. Hind wing: outer margin even; vein 7 well before the end of cell; discocellulars and vein 5 very faint; vein 3 shortly before end of cell, about twice as far from 2 as from 4; vein 2 considerably nearer to end of cell than to base of wing. In the male there is a conspicuous oval glandular patch on the disk of the hind wing on the upperside, and there is also a tuft of hairs on the underside of the fore wing, attached to the basal half of the inner margin.

laronia, Hew. ..... 1.
thora, Plötz ..... 2.

And two unidentified species.
Confined to Africa.

13. Genus Butleria. (Plate III. fig. 21.)

Butleria, Kirby, Syn. Cat. 624 (1871). Type, *valdivianus*, Phil.
Antennæ: club rather robust, arcuate, tip acuminate. Palpi porrect; second joint long, densely clothed; third joint slender, naked, obtusely conical. Fore wing; costa arched at base, then straight to apex, having the appearance of being slightly excised; inner margin longer than outer margin; cell less than two-thirds length of costa; vein 12 reaching costa before the end of cell; discocellulars suberect; vein 6 almost equidistant from 4 and 6; vein 3 well before the end of cell; vein 2 slightly nearer to base of wing than to end of cell. Hind wing; outer margin even; vein 7 well before end of cell; discocellulars and vein 5 faint; vein 3 shortly before end of cell; vein 2 twice as far from base of wing as from end of cell. Hind tibiæ with two pairs of spurs (except in *sotoi* and *philippii*).

dimidiatus, Feld. ..... 1.
**caicus*, Hew. ..... 2.
jelskyi, Ersch ..... 3.
**eryonas*, Hew. ..... 4.
**diraspes*, Hew. ..... 5.
**oxaites*, Hew. ..... 6.
**evages*, Hew. ..... 7.
hesperioides, Feld. ..... 8.
**caracates*, Hew. ..... 9.
**eburones*, Hew. ..... 10.
ibhara, Butl. ..... 11.
agathocles, Feld. ..... 12.
**arsines*, Hew. ..... 13.
polycrates, Feld. ..... 14.
hilina, Butl. ..... 15.
epiphaneus, Feld. ..... 16.
cypselus, Feld. ..... 17.
**cænides*, Hew. ..... 18.
bissexguttatus, Phil. ... 19.
valdivianus, Phil. ..... 20.
exornatus, Feld.
flavomaculatus, Blanch.. 21.
polyspilus, Feld.
paniscoides, Blanch. ... 22.
**canquenensis*, Reed.
**vicina*, Reed ..... 23.
**fruticolens*, Butl. ..... 24.
*var. *tractipennis*, Butl.
*var. *quadrinotatus*, Butl.
*var. *pulcher*, Butl.
**philippii*, Butl. ..... 25.
**sotoi*, Reed ..... 26.

The last two species have only terminal spurs on the hind tibiæ. This is a very large genus, confined to the tropical regions of the New World; it includes forms of which the extremes are very dissimilar in coloration, but which grade one into another imperceptibly.

14. Genus Amblyscirtes.

Amblyscirtes, Sc. Syst. Rev. p. 54 (1872). Type, *vialis*, Edw.
Stomyles, Sc. Syst. Rev. p. 55 (1872). Type, *textor*, Hübn.
Amblyscirtes, Sc. Butt. New England, vol. ii. p. 1575 (1889).

Antennæ rather short; club moderate, with a short terminal crook. Palpi: second joint densely scaled; third joint erect, short, bluntly conical. Fore wing: costa straight, slightly excised before apex; cell less than two-thirds the length of costa; vein 5 almost equidistant from 4 and 6; vein 3 shortly before end of cell; vein 2 slightly nearer to base of wing than to end of cell. Hind wing: outer margin even; vein 7 close to end of cell; discocellulars and vein 5 barely traceable; vein 3 from end of cell; vein 2 considerably nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs.

vialis, Edw. ... 1. | *conus*, Edw. ... 3.
eos, Edw. ..... 2. | *textor*, Hübn. ... 4.

I am unable to point out any structural differences between *vialis* and *textor*, the types of *Amblyscirtes* and *Stomyles* respectively. The generic characters of *Stomyles* have never been particularized.

Confined to North America.

15. Genus Aeromachus.

Aeromachus, de Nicéville, Journ. Bomb. Nat. Hist. Soc. v. p. 214 (1890). Type, *stigmata*, Moore.

Antennæ: club rather robust, with a short terminal crook, tip acuminate. Palpi: second joint pressed close against face; third joint porrect, short, obtusely conical. Fore wing: inner margin longer than outer margin; cell less than two-thirds the length of costa; vein 5 almost equidistant from 4 and 6. In the male of the type species vein 3 is well before end of cell, vein 2 very close to 3, lower margin of cell bent upwards at vein 3. In the other species of the genus, vein 3 is immediately before the end of the cell, and vein 2 well before the end, but considerably nearer to it than to base of wing. Hind wing: outer margin even; vein 7 well before the end of cell, both veins at its bifurcation curved outwards in the male of the type species, but meeting at an acute angle in the other species of the genus, vein 7 also arising near the end of cell; discocellulars and vein 5 barely traceable; vein 3 immediately before the end of cell; vein 2 nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs. Male in the type species with a short discal stigma on the upperside of the fore wing, extending from the origin of vein 3 and just below vein 1. There are no secondary sexual characters on the wings of the other species.

stigmata, Moore ..... 1. | *jhora*, de Nicéville ..... 3.
indistincta, Moore ..... 2. | *kali*, de Nicéville ..... 4.

Confined to Southern Asia.

16. Genus SEBASTONYMA, nov.

Type, *dolopia*, Hew.

Antennæ: club elongate, with a short apical crook, tip acuminate. Palpi: third joint minute, obtusely conical. Fore wing: inner margin longer than outer margin; cell less than two-thirds the length of costa; middle discocellular slightly longer than lower one; vein 5 slightly nearer to 4 than to 6; vein 3 immediately before end of cell; vein 2 close to end of cell, twice as far from base of wing as from end of cell. Hind wing not at all elongated, outer margin even; costa strongly arched at base; vein 7 shortly before end of cell; discocellulars faint, vein 5 not traceable; vein 3 immediately before end of cell; vein 2 considerably nearer to end of cell than to base of wing; lower margin of cell slightly angled at vein 2. Hind tibiæ naked and with two pairs of spurs.

Male with a tuft of hairs affixed at base of the inner margin on underside of fore wing and pointing upwards.

**dolopia*, Hew.

Confined to the Indian region.

17. Genus PEDESTES, nov.

Type, *masuriensis*, Moore.

Antennæ short; club robust, arcuate with no distinct terminal crook, tip acuminate. Palpi: third joint entirely concealed in the clothing of the second joint. Fore wing: inner margin longer than outer margin; cell less than two-thirds the length of costa; vein 12 reaching costa almost opposite end of cell; discocellulars suberect; vein 5 slightly nearer to 4 than to 6; vein 3 close to end of cell, rather more than twice as far from 2 as from 4; vein 2 nearer to end of cell than to base of wing. Hind wing not elongate; outer margin even, inconspicuously excavated at vein 2; vein 7 shortly before end of cell; discocellulars and vein 5 very faint; *vein 3 from end of cell*; vein 2 more than twice as far from base of wing as from end of cell. Hind tibiæ with two pairs of spurs. No secondary sexual characters on wings of male.

masuriensis, Moore ... 1.
pandita, de Nicéville ... 2.

This genus is confined to the Indian region.

18. Genus ARNETTA, nov.

Type, *atkinsoni*, Moore.

Antennæ: club slender, elongate, with a short terminal crook, tip acuminate. Palpi porrect; second joint densely scaled; third joint projecting horizontally in front of the face, short, obtusely conical. Fore wing rather produced apically, less so in female; inner and outer margins subequal; cell less than two-thirds the length of costa; vein 12 reaching costa almost opposite the end of cell; discocellulars suberect; vein 5 slightly nearer to 4 than to 6; vein 3 close to end

of cell, about twice as far from 2 as from 4; vein 2 almost equidistant from end of cell and from base of wing. Hind wing evenly rounded; vein 7 shortly before end of cell; discocellulars and vein 5 very indistinct; vein 3 shortly before end of cell, about twice as far from 2 as from 4; vein 2 considerably nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs.

atkinsoni, Moore ..... 1.
**subtestaceus*, Moore ... 2.
vindhiana, Moore ..... 3.
nilgiriana, Moore ..... 4.

In the males of *atkinsoni* and *subtestaceus* there is attached along the basal half of the inner margin of the fore wing a tuft of longish hairs which are turned up and spread out fanwise over the underside of the hind wing.

"*Isoteinon*" *khasianus*, Moore, *modesta*, Moore, and *microstictum*, W.-M. and de Nicév., also probably belong to this genus, but there are no specimens available for examination.

Confined to the Oriental region.

19. Genus Hyarotis.

Hyarotis, Moore, Lep. Ceyl. vol. i. p. 174 (1881).
Type, *adrastus*, Cramer.

Antennæ long; club moderate, elongate, with a short recurved crook, tip acuminate. Palpi erect; third joint obtusely conical, short, almost entirely concealed in the clothing of the second joint. Fore wing: inner and outer margins subequal; cell less than two-thirds the length of costa; vein 12 reaching costa before the end of cell; discocellulars inwardly oblique, the middle one the longer; vein 5 nearer to 4 than to 6; vein 3 very close to end of cell; vein 2 slightly nearer to base of wing than to end of cell. Hind wing rather elongate in male, more rounded in female, outer margin even; vein 7 well before the end of cell, only slightly nearer to 6 than to 8; discocellulars faint, outwardly concave; vein 5 not traceable; vein 3 immediately before end of cell; vein 2 considerably nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs.

adrastus, Cram.
praba, Moore.
**phœnicis*, Hew.

Allied to *Isoteinon*.

Confined to Southern Asia.

20. Genus Hypoleucis.

Hypoleucis, Mab. C. R. Soc. Ent. Belg. vol. xxxv. p. lxix (1891).
Type, *tripunctata*, Mab.

Antennæ: club slender, with a short terminal crook. Palpi: second joint densely scaled; third joint minute, obtusely conical. Fore wing: inner and outer margins subequal; cell less than two-thirds the length of costa; vein 5 slightly nearer to 4 than to 6; vein 3 immediately before end of cell; vein 2 almost equidistant from end

of cell and base of wing, slightly nearer to base of wing. Hind wing: outer margin even; vein 7 shortly before end of cell; vein 3 from end of cell; vein 2 more than twice as far from base of wing as from end of cell. Hind tibiæ with two pairs of spurs.

**ophiusa*, Hew.

The above diagnosis is taken from *ophiusa*, Hew., which Mabille includes in his genus *Hypoleucis*.

Confined to Africa.

21. Genus Isoteinon.

Isoteinon, Felder, Wien. ent. Monat. vi. p. 30 (1862).

Type, *lamprospilus*, Felder.

Antennæ: club moderate, elongated, terminal crook short, tip acuminate. Palpi: second joint densely clothed with short scales; *third joint erect*, reaching well above the vertex of the head, slender, obtusely conical. Fore wing: inner margin considerably longer than outer margin; cell less than two-thirds the length of costa; discocellulars erect; vein 5 slightly nearer to 4 than to 6; vein 3 close to end of cell; vein 2 about equidistant from end of cell and base of wing in the male, considerably nearer to base of wing in the female. Hind wing narrow; vein 7 shortly before end of cell; discocellulars and vein 5 faint, but distinctly traceable; vein 3 immediately before end of cell. Hind tibiæ sparsely clothed with hairs and with two pairs of spurs. No secondary sexual characters on the wings.

lamprospilus, Feld.
vitrea, Murray.

Many Indian species have been put into this genus; none of those, however, which I have been able to examine belong to it, the direction of the third joint of the palpi alone readily distinguishing them. This genus appears to be allied to *Hyarotis*, Moore.

Habitat. China and Japan.

22. Genus Isma.

Isma, Distant, Rhop. Malay. p. 386 (1886).

Type, *obscura*, Dist.

Antennæ: club slender, elongate, with a short terminal crook, tip acuminate. Palpi porrect; third joint slender, almost concealed, bluntly conical. Fore wing: inner margin longer than outer margin; cell less than two-thirds the length of costa; vein 12 reaching costa well before the end of cell; discocellulars suberect; vein 5 slightly nearer to 4 than to 6; vein 3 shortly before end of cell; vein 2 almost equidistant from vein 3 and base of wing. Hind wing: not at all elongated, outer margin even, inconspicuously excised as vein 2; vein 7 immediately before end of cell, very remote from base of wing; discocellulars faint, strongly outwardly oblique; vein 5 not traceable; vein 3 close to end of cell; vein 2 more than twice as far from base of wing as from end of cell; lower

margin of cell not angulated at vein 2 or 3. Hind tibiæ naked and with two pairs of spurs. No sexual characters on wings.

* *cephala*, Hew. ..... 1.
* *bononia*, Hew. ..... 2.

"*Hesperia?*" *cephaloides*, de Nicéville, also probably belongs to this genus.

There is no doubt that *cephala* and *bononia* are congeneric, and Distant puts the latter into his genus *Isma*, though, judging from the plate, the type species *obscura* appears to differ from *bononia* considerably.

Confined to Burma and Malaysia.

23. Genus Lophoides, nov.

Type, *iapis*, de Nicéville.

Antennæ long; club slender, elongated, with a short terminal crook. Fore wing produced at apex, inner margin slightly longer than outer margin; cell less than two-thirds length of costa; vein 12 reaching costa well before the end of cell; discocellulars suberect; vein 5 slightly nearer to 4 than to 6; vein 3 shortly before the end of cell; vein 2 from close to base of wing (in the female vein 2 will probably be found to be further removed from the base). Hind wing: outer margin evenly rounded; vein 7 well before the end of cell; discocellulars faint; vein 5 not traceable; vein 3 shortly before end of cell; vein 2 nearer to end of cell than to base of wing. Hind tibiæ naked and with two pairs of spurs.

Male with an oval glandular patch at extreme base of fore wing, more conspicuous on the underside, with a tuft of longish hairs, directed upwards, affixed to the inner margin of the fore wing on the underside, with a similar tuft of laxly set hairs on the upper-side of the hind wing near the base of the costal margin, and with a fringe of long hairs at the anal angle of hind wing.

iapis, de N.

Habitat. Burma.

24. Genus Zographetus, nov.

Type, *satwa*, de Nicéville.

Antennæ: club elongate, with a short apical crook, tip acuminate. Palpi: third joint minute, obtusely conical. Fore wing: apically rather produced; inner margin longer than outer margin; cell less than two-thirds the length of costa; vein 12 reaching costa before the end of cell; discocellulars suberect, the middle one slightly longer than the lower; vein 5 slightly nearer to 4 than to 6; vein 3 shortly before end of cell; vein 2 very close to base of wing (in the female vein 2 is about equidistant from base of wing and vein 3). Hind wing: outer margin slightly excavated at vein 2; vein 7 well before the end of cell, arising at an acute angle; vein 3 immediately before end of cell; vein 2 very close to vein 3, more than twice as far from base of wing as from end of cell; lower

margin of cell slightly angled at vein 2. Hind tibiæ with two pairs of spurs.

Male with two pairs of linear glandular streaks on the upperside of the fore wing, the upper pair on either side of vein 2 at its bifurcation, the lower two immediately beneath these on either side of vein 1. These glandular streaks are most developed in *satwa*, and least in *ogygia*.

satwa, de Nicéville ..... 1.
flavipennis, de Nicéville ..... 2.
**ogygia*, Hewitson ..... 3.

Confined to Southern Asia.

25. Genus Matapa.

Matapa, Moore, Lep. Ceyl. vol. i. p. 163 (1881).
Type, *aria*, Moore.

Antennæ: club robust, elongate, terminal crook moderate. Palpi: second joint very densely scaled, third joint entirely concealed. Fore wing: rather produced at apex, inner and outer margins subequal; cell less than two-thirds length of costa; discocellulars strongly inwardly oblique; vein 5 only slightly nearer to 4 than to 6; vein 3 well before the end of cell, slightly nearer to 4 than to 2; vein 2 slightly nearer to base of wing than to end of cell; lower margin of cell angled at vein 3. Hind wing: outer margin even, slightly excised between veins 3 and 1 *b*; vein 7 well before the end of cell; discocellulars faint; vein 5 obsolete; vein 3 from end of cell; vein 2 more than twice as far from base of wing as from end of cell. Hind tibiæ fringed and with two pairs of spurs.

Male with an oblique linear glandular streak on the upperside of the fore wing, extending from vein 3 as far as vein 1.

aria, Moore ..... 1.
druna, Moore ..... 2.
sasivarna, Moore ..... 3.
shalgrama, de Nicéville ..... 4.

Confined to Southern Asia.

26. Genus Paduka.

Paduka, Distant, Rhop. Mal. p. 375 (1886).
Type, *lebadea*, Hewitson (=*glandulosa*, Dist.).

Antennæ and palpi much as in *Erionota*. Fore wing: cell less than two-thirds length of costa; inner margin longer than outer margin; vein 12 terminating before end of cell; vein 7 before end of cell; upper discocellular short but distinct, almost parallel with the costa; middle and lower discocellulars almost erect in the same straight line, the middle the longer; vein 3 four times as far from base of wing as from end of cell, and more than twice as far from 2 as from 4; vein 2 almost equidistant from 3, and base of wing ather nearer the latter. Hind wing: outer margin sinuated; ein 7 almost equidistant from 8 and 6; discocellulars outwardly

oblique; radial wanting; median bent upwards at vein 2; vein 3 equidistant from 2 and 4; vein 2 close to end of cell, very remote from base of wing. Hind tibiæ with two pairs of spurs, the upper pair minute.

The above description is from a female of the type species. In the male vein 3 of the fore wing is further from the end of the cell, and there are the following secondary sexual characters:—a discal patch of silky hairs on the upperside of fore wing, a long tuft of hairs on underside of fore wing at base of submedian, and two glandular streaks situated on veins 2 and 3 of the hind wing.

Closely allied to *Gangara*.

Iebadea, Hew.
glandulosa, Dist.
subfasciata, Moore.

Confined to Southern Asia.

27. Genus Erionota.

Erionota, Mab. Ann. Soc. Ent. Belg. vol. xxi. p. 34 (1878).
Type, *thrax*, Linn.

Antennæ not hooked; club moderate, gradually thickened, terminal portion bent at more than a right angle, and gradually tapering to a point. Palpi: second joint pressed close against the face, densely scaled; the third joint entirely concealed. Fore wing: inner and outer margins subequal; cell considerably less than two-thirds length of costa; vein 12 reaching costa before the end of cell; upper angle of cell acute; upper discocellular minute, middle and lower discocellulars slightly oblique, the middle one the longer; vein 5 nearer to 4 than to 6; vein 3 hardly twice as far from 2 as from 4; vein 2 almost equidistant from vein 3 and base of wing. Hind wing: outer margin sinuate, slightly lobed towards anal angle; vein 7 nearly equidistant from 6 and 8; middle discocellular erect, lower strongly outwardly oblique; vein 5 wanting; vein 3 just before end of cell; vein 2 more than twice as far from base of wing as from end of cell. Hind tibiæ fringed, but not densely, and with two pairs of spurs.

Closely allied to *Gangara*.

thrax, Linn. ..... 1.
acroleuca, Wood-Mason, de Nicéville. 2.
hiraca, Moore.
lava, Swinhoe.

28. Genus Gangara.

Gangara, Moore, Lep. Ceyl. vol. i. p. 164 (1881).
Type, *thyrsis*, Fabr.

Antennæ and palpi as in *Erionota*. Fore wing: inner margin longer than outer margin; cell not much more than half the length of costa; vein 12 terminating before the end of cell; outer end of cell oval; upper discocellular very short, middle and lower discocellulars almost erect and in the same straight line, the

middle one the longer; vein 3 more than twice as far from 2 as from 4; vein 2 considerably nearer to base of wing than to vein 3, and about twice as far from end of cell as from base of wing. Hind wing: outer margin sinuate; middle discocellular very faint, almost erect, lower well developed, outwardly oblique; vein 5 wanting; vein 7 considerably nearer to 6 than to 8; vein 3 just before end of cell; vein 2 nearer to base of wing than to vein 3. Hind tibiæ slightly fringed and with two pairs of spurs.

In the male there is on the fore wing a linear glandular streak lying above the central portion of vein 1, and a second double streak lying on both sides of the basal half of vein 2; on the hind wing the basal half of veins 2 and 3 and the portion of the lower margin of the cell lying between them are much swollen. On the underside of the fore wing also there is a patch of erect hairs extending from vein 1 to the inner margin, and the hind wing above is thickly clothed from its base with long hairs which conceal the swollen veins. Abdomen conspicuously tufted above.

{ *thyrsis*, Fabr. ..... 1.
{ *pandia*, Moore.

Confined to Southern Asia.

29. Genus Sancus. (Plate II. fig. 9.)

Sancus, de Nicéville, Journ. Nat. Hist. Soc. Bombay, vol. vi. no. 3, p. 395 (1891). Type, *subfasciatus*, Moore.
? *Psolos*, Mabille, MS. ? Type, *pulligo*, Mabille.

Antennæ: club elongate, tip acuminate, recurved. Palpi: second joint densely scaled, third joint almost concealed. Palpi and antennæ as in *Kerana*. Fore wing much elongated. "Male with a curious impressed elongated oval brand placed so immediately behind as to touch the median nervure." Vein 11 of the fore wing strongly deflected upwards soon after its origin and touching the costal nervure for a short distance; vein 5 nearer to 4 than to 6; middle discocellular longer than lower one.

Allied to *Kerana*, *Astictopterus*, *Iambrix*, and *Koruthaialos*. From the three former it may be distinguished by the confluence of veins 11 and 12, and from the latter by the differently formed palpi.

{ *pulligo*, Mabille ..... 1.
{ *subfasciatus*, Moore.
{ *ulunda*, Plötz.
{ *fuscula*, Snellen ..... 2.
{ *celunda*, Staud.

There has been some doubt about the correct synonymy of the species of this genus, chiefly owing to Heer Snellen having stated that the characteristic "male mark" of the genus is wanting in *fuscula*. The courtesy of the Hon. Walter Rothschild has, however, enabled me to examine four males and one female of undoubted *fuscula*, collected in S.W. Celebes by Mr. Doherty, and I find that the males have the "male mark" as in *pulligo*, though it is much

less conspicuous, being hardly visible on the upperside, but appearing below as a pale oval streak. This inconspicuous nature of the male mark in *fuscula* would doubtless account for its being overlooked by Heer Snellen, especially if the specimens he examined were at all worn. This species can be separated from *pulligo* by having the underside of the hind wing entirely unmarked, and by the beautiful plum-like bloom of the upperside. This last character is only apparent in fresh specimens, those in the Hewitson collection in the British Museum having faded to a dull brown. *Fuscula* seems to be confined to Celebes, while *pulligo* ranges from Assam throughout Burma, Malacca, Java, Borneo, Sulu, and Palawan, and also occurs in Southern India.

30. Genus Eumesia.

Eumesia, Felder, Reise Novara, p. 504 (1867).

Type, *semiargentea*, Feld.

Antennæ short, less than half the length of costa; club stout, arcuate, tip acuminate. Palpi porrect; third joint very slender, bluntly pointed. Fore wing: inner margin considerably longer than outer margin; cell less than two-thirds the length of costa; vein 12 reaching costa almost opposite the end of cell; vein 5 slightly nearer to 4 than to 6; vein 3 well before end of cell, much curved in its course; vein 3 slightly nearer to base of wing than to end of cell. Hind wing: outer margin evenly rounded; vein 7 shortly before end of cell; discocellulars and vein 5 barely traceable: vein 3 immediately before end of cell; vein 3 nearer to end of cell than to base of wing. No epiphysis on fore tibiæ. Hind tibiæ with terminal pair of spurs only, but beset with numerous short spines on the lower surface.

semiargentea, Feld.

Confined to tropical South America.

31. Genus Argopteron, nov.

Type, *aureipennis*, Blanch.

Antennæ more than half the length of costa; club moderate, straight, elongate, tip blunt. Palpi porrect; second and third joints slender, clothed to the tip with laxly set scales. Fore wing: costa very straight, inner margin considerably longer than outer margin; cell less than two-thirds the length of costa; vein 12 reaching costa before the end of cell; upper discocellular slightly longer than lower; vein 5 slightly nearer to 4 than to 6; vein 3 shortly before the end of cell; vein 2 more than twice as far from end of cell as from base of wing. Hind wing: outer margin rounded; vein 7 close to end of cell; *vein 5 well developed*, slightly nearer to 6 than to 4; vein 3 close to end of cell; vein 2 slightly nearer to base of wing than to end of cell. Fore tibiæ very long, without epiphysis. Hind tibiæ with only terminal pair of spurs. Abdomen reaching well beyond the anal angle of the hind wings.

aureipennis, Blanch. ..... 1. | *puelmæ*, Caly. ..... 2.

Mabille has recently redescribed what is accepted as the female of *aureipennis* under the name *Steropes tripunctatus*.

Confined to South America.

32. Genus HETEROPTERUS.

Heteropterus, Dum. Zool. Anal. p. 271 (1806).

Type, *morpheus*, Pall.

Antennæ short, less than half the length of costa; club moderate, straight, elongated, blunt. Palpi porrect, densely clothed with laxly set scales, almost concealing the third joint, which is short, slender, and bluntly conical. Fore wing: inner margin longer than outer margin; cell less than two-thirds the length of costa; vein 12 reaching costa before the end of cell; upper discocellular short but distinct; middle discocellular longer than lower; vein 5 slightly nearer to 4 than to 6; vein 3 shortly before end of cell; vein 2 more than twice as far from end of cell as from base of wing. Hind wing: outer margin even; vein 7 well before end of cell; discocellulars and vein 5 barely traceable; vein 3 well before end of cell, more than twice as far from 2 as from 4; vein 2 nearer to base of wing than to end of cell. No epiphysis on fore tibiæ. Hind tibiæ almost naked; in *morpheus* with two pairs of spurs, in *ornatus* only with terminal pair. Abdomen reaching beyond the anal angle of hind wings.

morpheus, Pall. ..... 1.
speculum, Rott.
steropes, Wien. Verz.
aracinthus, Fabr.
speculifer, Fourcr.
ornatus, Brem. ..... 2.

Morpheus is a European and *ornatus* a Japanese species.

33. Genus PAMPHILA.

Pamphila, Fabr. Ill. Mag. vi. p. 287 (1807).

Type, *palæmon*, Pall.

Steropes, Boisd. Voy. Astrol. p. 167 (1832). Nom. præoc.

Carterocephalus, Led. Verh. zool.-bot. Gesellsch. Wien, ii. pp. 26, 49.

Type, *palæmon*, Pall.

Antennæ short, not half the length of costa; club stout, elongate, blunt. Palpi porrect, densely clothed with laxly set scales almost concealing the third joint, which is short, slender, and bluntly conical. Fore wing: inner margin considerably longer than outer margin; cell less than two-thirds the length of costa; vein 12 reaching costa before the end of cell; upper discocellular short but distinct, outwardly oblique; middle discocellular slightly longer than lower; vein 5 slightly nearer to 4 than to 6; vein 3 very close to end of cell; vein 2 almost equidistant from base of wing and end of cell. Hind wing: outer margin even; cell very long, reaching more than half across wing; vein 7 shortly before end of cell; discocellulars and vein 5 barely traceable; vein 3 immediately before end of cell; vein 2 considerably nearer to end of cell than to

base of wing. No epiphysis on fore tibiæ. Hind tibiæ slightly fringed and with only terminal pair of spurs.

palemon, Pall. ..... 1.		*mesapano*, Sc. ..... 3.	
paniscus, Fabr.		*sylvius*, Knoch ..... 4.	
brontes, Wien. Verz.		*sylvicola*, Meig.	
mandan, Edw. ..... 2.		*argyrostigma*, Eversm. 5.	

Some 600 or 700 species have been described in this genus, though the above five probably represent all the species which correctly belong to it. The remainder include species belonging to almost every described genus.

Distribution. Holarctic.

34. Genus Cyclopides. (Plates II. fig. 10; III. fig. 14.)

Cyclopides, Hübn. Verz. p. 111 (1816). Type, *metis*, Linn.

Antennæ short, less than half the length of costa; club blunt, oval, without terminal crook. Palpi porrect; second joint thickly clothed with lax scales, almost concealing the third joint, which is slender and obtusely conical. Fore wing short and broad, outer margin convex, considerably shorter than inner margin; cell less than two-thirds the length of costa; vein 12 reaching costa well before the end of cell; *vein* 11 *very short, running at once into* 12; discocellulars suberect; vein 5 almost equidistant from 4 and 6, slightly nearer to 4; vein 3 close to end of cell; vein 2 equidistant from base of wing and vein 3. Hind wing evenly rounded; discocellulars and vein 5 hardly traceable; vein 2 nearer to 3 than to base of wing. No epiphysis on fore tibiæ. Hind tibiæ with two pairs of spurs, except in *willemi*, in which the upper pair are wanting; both pairs are distinct in the other five species here quoted except in *meninx*, in which the upper pair are minute.

metis, Linn. ..... 1.		*willemi*, Wallgr. ..... 4.	
malgacha, Boisd. ..... 2.		*cheles*, Hew.	
limpopona, Wallgr.		*meninx*, Trim. ..... 5.	
ægipan, Trim. ..... 3.		*argenteostriatus*, Plötz.	

And one unnamed species.

Confined to Africa.

Synopsis of Genera of Pamphilinæ.

Section B.

a. Tip of antennæ blunt.

*a*¹. Club of antennæ forming a hollowed disk.

Taractrocera, Butler. Type, *mævius*, Fabr. (1)

*b*¹. Club of antennæ elongate.

*a*². Third joint of palpi horizontal.

*a*³. Apex of fore wing not produced.

Ampittia, Moore. Type, *maro*, Fabr. (2)

*b*³. Apex of fore wing produced.

Kedestes, g. n. Type, *lepenula*, Wallgr. (3)

*b*². Third joint of palpi erect.

*a*³. Fore wing very elongate.

Apaustus, Hbn. Type, *menes*, Cram. (4)

b^3. Fore wing not elongate.
a^4. Fore wing: costa evenly arched, making the wing appear broader. ANCYLOXYPHA, Feld. Type, *numitor*, Fabr. (5)
b^4. Fore wing, costa slightly concave.
a^5. Vein 2 of fore wing nearer to end of cell than to base of wing. COPAEODES, Speyer. Type, *procris*, Felder. (6)
b^5. Vein 2 of fore wing nearer to base of wing than to end of cell. ADOPAEA, Billb. Type, *thaumas*, Hufn. (7)
b. Tip of antennæ acuminate.
a^1. Terminal crook of antennæ minute, never as long as the width of the club.
a^2. Antennæ about twice as long as the breadth of thorax, but less than half as long as the costa.
a^3. Vein 3 of fore wing immediately before the end of cell.
a^4. Discal stigma on fore wing of male continuous, followed beneath by an inconspicuous field of erect scales. ERYNNIS, Schrank. Type, *comma*, Linn. (8)
ANTHOMASTER, Sc. Type, *leonardus*, Harr. (9)
b^4. Discal stigma on fore wing of male bordered on either side by a streak of specialized scales, but with no field of erect scales beneath. OCHLODES, Sc. Type, *venatorum*, Boisd. (10)
c^4. Discal stigma of male discontinuous, followed beneath by a more or less conspicuous field of specialized scales. Hind tarsi longer than middle tarsi. THYMELICUS, Hbn. Type, *vibex*, Hbn. (11)
d^4. Discal stigma of male discontinuous, followed beneath by a very conspicuous field of specialized scales. Hind tarsi not longer than middle tarsi. ATALOPEDES, Sc. Type, *huron*, Edw. (12)
b^3. Vein 3 of fore wing well before the end of cell. POLITES, Sc. Type, *peckius*, Kirby. (13)
b^2. Antennæ very short, hardly longer than the breadth of the thorax.
a^3. Vein 2 of fore wing nearer to base of wing than to end of cell. HYLEPHILA, Billb. Type, *phylæus*, Drury. (14)
b^3. Vein 2 of fore wing nearer to end of cell than to base of wing. GEGENES, Hbn. Type, *pygmæus*, Hbn. (19)
b^1. Terminal crook of antennæ short, as long as or slightly longer than the width of the club.
a^2. Club of antennæ short and stout.
a^3. Vein 2 of fore wing hardly nearer to end of cell than to base of wing. CALPODES, Hbn. Type, *ethlius*, Cram. (20)
b^3. Vein 2 of fore wing considerably nearer to end of cell than to base of wing. PARNARA, Moore. Type, *guttatus*, Brem. (21)
b^2. Club of antennæ comparatively elongate.
a^3. Fore wing: outer margin hardly, if at all, longer than inner margin.
a^4. Antennæ of moderate length.
a^5. Vein 11 of fore wing not approximating to 12.
a^6. Vein 3 of hind wing from before end of cell.
a^7. Vein 2 of fore wing in the male nearer to end of cell than to base of wing.
a^8. Male, vein 3 of fore wing immediately before end of cell.
a^9. No discal stigma in male.
a^{10}. Vein 3 of fore wing hardly twice as far from 2 as from 4. BADORIS, Moore. Type, *ocia*, Hew. (22)
b^{10}. Vein 3 of fore wing many times further from 2 than from 4.
a^{11}. Outer margin of fore wing longer than inner margin. LERODEA, Sc. Type, *eufala*, Smith-Abb. (23)

b^{11}. Inner margin of fore wing longer than outer margin.
PADRAONA, Moore. Type, *mæsa*, Moore. (15)
b^{9}. Male with a discal stigma on fore wing.
PHLEBODES, Hbn. Type, *pertinax*, Cram. (30)
b^{8}. Male, vein 3 of fore wing well before the end of cell.
a^{9}. Male with a discal stigma on fore wing.
TELICOTA, Moore. Type, *augias*, Linn. (16)
b^{9}. No discal stigma on fore wing of male.
ONRYZA, g. n. Type, *meiktila*, de N. (35)
b^{7}. Vein 2 of fore wing in both sexes nearer to base of wing than to end of cell.
a^{7}. Male with a circular glandular patch on hind wing at origin of vein 3.
CUPITHA, Moore. Type, *tympanifera*, Moore. (34)
b^{7}. Male with a linear discal stigma on upperside of fore wing.
a^{8}. Hind and middle tibiæ conspicuously spined.
LIMOCHORES, Sc. Type, *manataaqua*, Sc. (24)
b^{8}. Hind and middle tibiæ not spined.
a^{10}. Vein 3 of hind wing shortly before end of cell, almost twice as far from 2 as from 4.
EUPHYES, Sc. Type, *metacomet*, Harris. (25)
b^{10}. Vein 3 of hind wing immediately before end of cell, many times further from 2 than from 4.
AUGIADES, Hbn. Type, *sylvanus*, Esp. (17)
c^{8}. Male with two glandular streaks and a tuft of hair on underside of fore wing.
GEHENNA, g. n. Type, *abima*, Hew. (27)
d^{8}. No secondary sexual characters on the wings.
a^{9}. Club of antennæ apart from terminal crook straight.
a^{10}. Vein 7 of hind wing less than twice as far from 8 as from 6.
a^{11}. Vein 2 of hind wing less than twice as far from base of wing as from end of cell.
PHEMIADES, Hbn. Type, *phineus*, Cram. (18)
b^{11}. Vein 2 of hind wing more than twice as far from base of wing as from end of cell.
OLIGORIA, Sc. Type, *maculata*, Edw. (26)
b^{10}. Vein 7 of hind wing more than twice as far from 8 as from 6.
a^{11}. Vein 2 of hind wing twice as far from base of wing as from end of cell.
ACTINOR, g. n. Type, *radians*, Moore. (28)
b^{11}. Vein 2 of hind wing not twice as far from base of wing as from end of cell.
a^{12}. Hind wing produced in the median area, the distance from base of wing to extremity of vein 4 considerably greater than the distance from extremity of vein 8 to extremity of vein 1 *a*.
UDASPES, Moore. Type, *folus*, Cram. (37)
b^{12}. Hind wing not produced in the median area, the distance from base of wing to extremity of vein 4 less than the distance from extremity of vein 8 to extremity of vein 1 *a*.
NOTOCRYPTA, de N. Type, *curvifascia*, Feld. (36)
b^{9}. Club of antennæ apart from terminal crook arcuate. POANES, Sc. Type, *massasoit*, Sc. (31)

b^6. Vein 3 of hind wing from end of cell.
a^7. Fore wing short and broad, not apically produced.
PHYCANASSA, Sc. Type, *viator*, Edw. (32)
b^7. Fore wing produced apically.
a^8. Vein 3 of fore wing nearer end of cell than base of wing. HALPE, Moore. Type, *beturia*, Hew. (29)
b^8. Vein 3 of fore wing nearer base of wing than end of cell. ATRYTONE, Sc. Type, *iowa*, Sc. (33)
b^5. Vein 11 of fore wing running very close to 12.
a^6. Palpi conspicuous.
BARACUS, Moore. Type, *vittatus*, Feld. (38)
b^6. Palpi inconspicuous.
ASTICTOPTERUS, Feld. Type, *jama*, Feld. (39)
b^4. Antennæ exceptionally long.
a^5. Vein 3 of hind wing well before end of cell.
KERANA, Dist. Type, *armatus*, Druce. (40)
b^5. Vein 3 of hind wing immediately before end of cell.
a^6. Hind tibiæ thickly set with short spines and with only terminal pair of spurs.
KATREUS, g. n. Type, *johnstonii*, Butler. (41)
b^6. Hind tibiæ not spined and with two pairs of spurs.
a^7. Vein 2 of fore wing nearer to base of wing than to end of cell.
a^8. Vein 2 of hind wing almost equidistant from end of cell and base of wing.
ANCISTROIDES, Butl. Type, *longicornis*, Butl. (42)
b^8. Vein 2 of hind wing more than twice as far from base of wing as from end of cell.
PIRDANA, Dist. Type, *hyela*, Hew. (43)
b^7. Vein 2 of fore wing nearer to end of cell than to base of wing.
a^8. Vein 11 of fore wing running very close to 12.
PARDALEODES, Butl. Type, *edipus*, Cram. (44)
b^8. Vein 11 of fore wing not approximating to 12.
CERATRICHIA, Butl. Type, *nothus*, Fabr. (45)
b^3. Fore wing, outer margin considerably longer than inner margin.
a^4. No secondary sexual characters on fore wing of male.
PLASTINGIA, Butl. Type, *flavescens*, Feld. (46)
b^4. Male with a linear discal stigma on fore wing.
LEREMA, Sc. Type, *accius*, Smith-Abb. (47)
c^1. Terminal crook of antennæ long, about twice as long as the breadth of the club.
a^2. Male with a tuft of hairs at base of fore coxæ.
PITHAURIA, Moore. Type, *murdava*, Moore. (48)
b^2. No tuft of hair on fore coxæ of male.
a^3. Hind wing conspicuously elongated, anal angle pointed.
NICONIADES, Hbn. Type, *xanthaphes*, Hbn. (49)
b^3. Hind wing only slightly elongate, anal angle rounded.
a^4. Vein 3 of fore wing immediately before end of cell, more than three times as far from 2 as from 4.
a^5. No discal stigma on fore wing of male.
a^6. Fore wing not apically produced, apex not truncate.
a^7. Costa of fore wing evenly arched from base to apex.
COBALUS, Hbn. Type, *virbius*, Cram. (50)
b^7. Costa arched at base, then straight to apex.
LYCHNUCHUS, Hbn. Type, *olenus*, Hbn. (51)
b^6. Fore wing apically produced, apex truncate.
CARYSTUS, Hbn. Type, *jolus*, Cram. (52)
c^6. Fore wing apically produced, apex not truncate.
LOTONGUS, Dist. Type, *calathus*, Hew. (53)

b^3. Male with a discal stigma on fore wing.
a^6. Fore wing apically produced, apex slightly truncate; discal stigma of male faint.
THRACIDES, Hbn. Type, *phidon*, Cram. (54)
b^6. Fore wing not produced apically, outer margin evenly convex; discal stigma of male conspicuous.
TALIDES, Hbn. Type, *sergestus*, Cram. (55)
b^4. Vein 3 of fore wing well before end of cell, less than twice as far from 2 as from 4.
a^7. Male with a discal stigma on fore wing.
PERICHARES, Sc. Type, *corydon*, Fabr. (56)
b^7. No discal stigma on fore wing of male.
a^8. Vein 5 of hind wing wanting.
a^9. Vein 2 of fore wing almost equidistant from end of cell and base of wing.
UNKANA, Dist. Type, *batara*, Dist. (57)
b^9. Vein 2 of fore wing almost equidistant from vein 3 and base of wing. HIDARI, Dist. Type, *irava*, Moore. (58)
b^8. Vein 5 of hind wing well developed.
PTEROTEINOS, g. n. Type, *laufella*, Hew. (59)

1. Genus TARACTROCERA. (Plate III. fig. 20.)

Taractrocera, Butler, Cat. Lep. Fabr. p. 279 (1869).
Type, *mævius*, Fabr.

Antennæ short; club forming a flattened disk, conspicuously hollowed out, tip blunt. Palpi: second joint densely scaled; third joint long, slender, erect, reaching above the vertex, tip acuminate. Fore wing: inner margin longer than outer margin; cell less than two-thirds the length of costa; vein 12 reaching costa well before the end of cell; middle discocellular considerably longer than lower one; vein 5 close to bottom of cell; vein 3 well before end of cell, about twice as far from 2 as from 4; vein 2 slightly nearer to end of cell than to base of wing. Hind wing: outer margin even; vein 7 very close to end of cell; discocellulars faint; vein 5 not traceable; vein 3 immediately before end of cell; vein 2 twice as far from base of wings as from end of cell. Hind tibiæ with two pairs of spurs.

The only species of those mentioned below in which there is a stigma in the male is *papyria*, Boisd., in which there is an exceptionally long, slightly oblique stigma on the fore wing, extending from vein 5 as far as vein 1, meeting the latter considerably nearer the margin than the base of wing.

mævius, Fabr. ..... 1.
flaccus, Fabr.
sagara, Moore.
celæno, Cox ..... 2.
**ardonia*, Hew. ..... 3.
**danna*, Moore ..... 4.
flavovittata, Latr. ..... 5.
papyria, Boisd. ..... 6.
nigrolimbatus, Snell. ..... 7.
**nicevillei*, sp. n. ..... 8.
**ceramus*, Hew. ..... 9.

And seven unidentified species. The "*Pamphila*" *avonti* of de Nicéville also probably belongs to this genus.

This is a genus of very numerous species, which ranges from India through the Malay Archipelago to Australia, appearing to reach

its greatest development in the islands of the Archipelago; the peculiar form of the antennal club readily distinguishes it.

TARACTROCERA NICEVILLEI, sp. nov.

Above dark brown, spotted with yellow. Fore wing with a lunate spot at end of cell; a subapical spot divided into three by veins, a spot below this and close to the outer margin divided into two, and a triple spot extending from the upper median branch to as far as the submedian parallel to the outer margin, but further removed from it than the double spot above mentioned; these three spots form a sort of submarginal band from the costa to the inner margin, though not reaching either, the middle spot being much nearer the margin than the other two. Hind wing: a lunate spot at end of cell, and a submarginal series of three spots, the first small, the second out of line, being nearer the margin of the wing, and the third double.

Underside markings as above, the whole of the hind wing and the apex and costa of the fore wing washed with yellow. Cilia above and below pale yellow.

Expanse 24 millim.

In the British Museum, from Bombay.

This is the species which has been recorded from India by Col. Swinhoe as *coras* of Cramer. The true *coras* of Cramer is, however, an American species and is the type of the genus *Polites*, Scudder.

Nearest allied to *T. ceramas*, Hew., from which it differs in the much greater prominence of all the yellow markings.

2. Genus AMPITTIA.

Ampittia, Moore, Lep. Ceyl. i. p. 171 (1881).

Type, *maro*, Fabr.

Antennæ short; club moderate, straight, tip blunt. Palpi: second joint densely clothed with laxly set scales; third joint porrect, conspicuous, slender, tip bluntly conical. Fore wing: inner margin longer than outer margin; cell less than two-thirds the length of costa; vein 12 reaching costa well before the end of cell; middle discocellular longer than lower one; vein 5 slightly nearer to 4 than to 6; vein 3 in the male of the type species well before the end of cell, nearer to 2 than to 4; vein 3 in the female immediately before the end of cell; vein 2 nearer to end of cell than to base of wing; lower margin of cell curved upwards from base to vein 2, and angled at vein 3. Hind wing evenly rounded; vein 7 shortly before end of cell, curving upwards from its origin, the upper margin of cell curving downwards, the angle therefore being rounded like a tuning-fork and not acute; discocellulars very faint; vein 5 not traceable; vein 3 from end of cell; vein 2 shortly before end of cell, considerably more than twice as far from base of wing as from end of cell. Hind tibiæ with two pairs of spurs.

Male in the type species with a short glandular streak on the

upperside of fore wing, situated immediately below the origin of vein 2, but not touching either vein 2 or vein 1. This streak is wanting in the other species of the genus.

maro, Fabr. ..... 1.
camertes, Moore.
? *dioscorides*, Fabr.
* *cariate*, Hew. ..... 2.
rhadama, Boisd. ..... 3.
inornatus, Trim. ..... 4.
pardalina, Butl. ..... 5.

To this genus would also appear to belong *mirza*, Mab., *bernieri*, Boisd., and *dispar*, Mab. There seems little doubt that the species described by Fabricius from Tranquebar as *dioscorides* is the female of *maro*; the latter name, however, being so well known has not been supplanted, as without examination of the type it is impossible to be quite certain that the two species are identical.

This genus appears to be confined to the Asiatic and African regions.

3. Genus Kedestes, nov.

Type, *lepenula*, Wallgr.

Thymelicus, Trimen (*nec* Hübn), S. Afric. Butt. vol. iii. p. 299 (1889).

Antennæ rather short; club straight, tip blunt. Palpi porrect, third joint very slender. Fore wing: apex rather pointed, costa straight, outer margin longer than inner margin; cell less than two-thirds the length of costa; vein 12 reaching costa before the end of cell; discocellulars inwardly oblique, the middle the longer; vein 5 nearer to 4 than to 6; vein 3 well before the end of cell, about twice as far from 2 as from 4; vein 2 almost equidistant from end of cell and base of wing. Hind wing: outer margin even; vein 7 well before the end of cell; discocellulars outwardly oblique; vein 5 barely traceable; vein 3 immediately before the end of cell; vein 2 nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs.

No sexual characters on wings except in *capenas*, in which there is a short discal stigma on fore wing of male, running from origin of vein 2 to about the centre of vein 1; vein 2 also arises slightly nearer to end of cell in the male of this species; in the female the neuration is as in the other species of the genus.

lepenula, Wallgr. ..... 1.
* *chersias*, Hew.
macomo, Trim. ..... 2.
* *capenas*, Hew. ..... 3.
* *derbice*, Hew.
chaca, Trim. ..... 4.
tucusa, Trim. ..... 5.
mohozutza, Wall. ..... 6.
callicles, Hew. ..... 7.

This genus is confined to the African region.

4. Genus Apaustus. (Plate III. fig. 26.)

Apaustus, Hübn. Verz. p. 113 (1816). Type, *menes*, Cramer.

Antennæ: club moderate, straight, tip blunt. Palpi: third joint long, slender, naked, erect, reaching considerably higher than the vertex of the head. Fore wing elongate, inner margin considerably longer than outer margin; cell short, hardly more than half the length of

costa; vein 12 reaching costa before the end of cell; upper discocellular short but distinct, almost at right angles with upper margin of cell; middle discocellular long, inwardly oblique, lower discocellular short, lower margin of cell bent abruptly upwards at vein 3, the portion between veins 3 and 4 being in the same straight line as the lower discocellular; vein 2 close to 3, many times further from base of wing than from vein 3. Hind wing very narrow, the abdomen extending far beyond the anal angle; outer margin even; vein 7 shortly before the end of cell; discocellulars and vein 5 faint; vein 3 shortly before the end of cell, twice as far from 2 as from 4; vein 2 almost equidistant from end of cell and base of wings. Hind tibiæ with two pairs of spurs.

menes, Cram. ..... 1.
gracilis, Feld. ... 2.

Confined to tropical South America.

5. Genus Ancyloxypha.

Ancyloxypha, Felder, Verh. zool.-bot. Gesellsch. Wien, xii. p. 477 (1862). Type, *numitor*, Fabr.

Antennæ very short; club moderate, straight, bluntly pointed. Palpi as in *Adopæa*. Fore wing not apically produced, costa and outer margin convex, inner margin longer than outer margin; cell less than two-thirds the length of costa; vein 12 very short, reaching costa before the centre; middle discocellular considerably longer than lower; vein 5 considerably nearer to 4 than to 6; lower margin of cell bent sharply upwards at vein 3, the portion between veins 3 and 4 lying in the same straight line as the lower discocellular; vein 3 consequently from lower angle of cell, about twice as far from 2 as from 4; vein 2 many times further from base of wing than from vein 3. Hind wing, outer margin even. Hind wing: vein 7 immediately before the end of cell; discocellulars sharply angled, the middle one being erect and the lower outwardly oblique; vein 5 not traceable; vein 3 shortly before the end of cell, nearer to 4 than to 2; vein 2 slightly nearer to end of cell than to base of wings. Hind tibiæ with two pairs of spurs. No sexual characters on wings.

numitor, Fabr.
puer, Hübn.

Habitat. North America.

The Asiatic species "*Cyclopides*" *subvittatus*, Moore, also appears to belong either to this genus or to one closely allied to it, but the only specimens I have been able to examine have been without antennæ and palpi; at any rate it does not belong to *Cyclopides*, from which the neuration at once separates it.

6. Genus Copæodes.

Copæodes, Speyer, Stett. ent. Zeit. 1878, p. 183.
Type, *procris*, Felder.

Antennæ very short; club robust, straight, apex rounded. Palpi

as in *Adopæa*. Fore wing: costa straight, outer margin rather excised for the lower half; inner margin longer than outer margin: cell less than two-thirds the length of costa; vein 12 reaching costa before end of cell; middle discocellular more than twice the length of lower; vein 5 from close to bottom of cell; vein 3 well before end of cell in male, shortly before in female; vein 2 considerably nearer to end of cell than to base of wing. Hind wing: outer margin even; vein 7 well before end of cell, only slightly nearer to 6 than to 8; discocellulars and vein 5 barely traceable; vein 3 immediately before end of cell; vein 2 more than twice as far from base of wing as from end of cell. Hind tibiæ with two pairs of spurs. Abdomen slender, extending beyond the anal angle of hind wings.

Male with a linear stigma, parallel to the costa, running along the basal third of vein 3 and continued for a short distance immediately below the lower margin of cell; the terminal two-thirds of vein 3 is much attenuated, the male mark apparently arresting its full development.

**aurantiaca*, Hew.	1.
procris, Felder.	
nanus, H. S.	2.

Confined to Northern and Central America.

7. Genus ADOPÆA. (Plate III. fig. 27.)

Adopæa, Billb. Enum. Ins. p. 81 (1820). Type, *thaumas*, Hufn.
Pelion, Kirby, List Brit. Rhop. (1858). Type, *thaumas*, Hufn.

Antennæ short, less than half the length of costa; club elongate, straight or slightly arcuate, tip blunt. Palpi: second joint clothed with laxly-set scales; third joint long, slender, suberect. Fore wing: inner margin longer than outer margin; cell less than two-thirds the length of costa; middle discocellular more than twice as long as lower; vein 5 from close to bottom of cell; vein 3 close to end of cell; vein 2 (in both sexes) slightly nearer to base of wing than to end of cell. Hind wing: outer margin even, slightly excised at vein 2; vein 7 well before end of cell, only slightly nearer to 6 than to 8; discocellulars very faint, vein 5 not traceable; vein 3 immediately before end of cell; vein 2 more than twice as far from base of wing as from end of cell. Hind tibiæ with two pairs of spurs. Abdomen slender, extending beyond anal angle of hind wings.

Male with a linear discal stigma on the fore wing, in two portions—the upper portion long, lying below the inner margin of cell, from the origin of vein 3 to as far as vein 2; the lower portion short, in continuation of the upper portion, from below vein 2 to not quite as far as vein 1.

thaumas, Hufn.	1.	*hyrax*, Led.	3.
linea, Wien. Verz.		*actæon*, Esp.	4.
venula, Hübn.		*hylax*, Fab.	5.
lineola, Ochs.	2.	**boeta*, Hew.	6.
virgula, Hübn.		*wrightii*, Edw.	7.

The species *wrightii* and *boeta* differ from the type in the more

knobbed antennæ, while *hylax* differs in the shape of the wings and in wanting the discal stigma in the male.

Distribution. Holarctic.

8. Genus Erynnis.

Erynnis, Schrank, Fauna Boica, ii. 1, p. 157 (1801). Type, *comma*, Linn.

Ocytes, Scudd. Syst. Rev. p. 55 (1872). Type, *metea*, Scudd.

Antennæ short, less than half the length of costa; club short, robust, terminal crook exceedingly minute. Palpi as in *Hylephila*. Neuration as in *Hylephila* except that vein 2 of the fore wing is much nearer to the base of the wing in the male, and vein 7 of the hind wing is slightly nearer the base of the wing in both sexes; the stigma on the fore wing is very similar to that of *Hylephila*, except that it entirely fills the angle at the bifurcation of vein 2, while in *Hylephila* the discal stigma crosses the interspace beyond the origin of vein 2.

comma, Linn. ..... 1.
colarado, Sc. ..... 2.
manitoba, Sc. ..... 3.
metea, Sc. ..... 4.
**florinda*, Butl. ..... 5.

Distribution. Holarctic.

9. Genus Anthomaster.

Anthomaster, Scudd. Syst. Rev. p. 57 (1872). Type, *leonardus*, Harr.

This genus does not differ appreciably from *Erynnis* in neuration or the stigma of the male, while the sexual organs show a remarkable similarity. The differences given by Scudder are very slight, and as far as the antennæ are concerned are absolutely imperceptible, and if it had not been separated by the greatest living authority on this group, it would have been unhesitatingly sunk in this paper as identical with *Erynnis*.

leonardus, Harris.

Confined to North America.

10. Genus Ochlodes.

Ochlodes, Scudd. Syst. Rev. p. 57 (1872). Type, *nemorum*, Boisd.

Antennæ short; club stout, rather elongate, with a minute terminal crook. Palpi as in *Hylephila*.

Neuration as in *Hylephila*, except that vein 7 of the hind wing is nearer to the base of the wing.

Male with a linear discal streak on fore wing, bordered on both sides with differently formed, loosely compacted scales.

nemorum, Boisd. ..... 1.
sonora, Sc. ..... 2.
agricola, Boisd. ..... 3.

Confined to North America.

11. Genus Thymelicus.

Thymelicus, Hübn. Verz. bek. Schmett. p. 113 (1816). Type, *vibex*, Hübn.
Hedone, Scudd. Syst. Rev. p. 58 (1872). Type, *brettus*, Hübn.
Pyrrhosidia, Scudd. Mem. Bost. Soc. Nat. Hist. ii. p. 346 (1874). Type, *mystic*, Scudd.

Antennæ less than half the length of costa; club very robust, short, crook very short. Palpi: second joint densely scaled, third joint bluntly conical, almost concealed.

Neuration of the fore wing as in *Hylephila*, and of the hind wing very similar except that vein 7 is slightly nearer the end of cell, and vein 2 rather more remote from end of cell. "Discal stigma of male unusually variable, but consisting in the main of two separated slender strigæ of dead black scales, that in the middle median interspace linear and arcuate, that in the lower subcircular or short linear, both surrounded and sometimes almost or quite concealed by overhanging, large and broad, somewhat loosely compacted scales, and followed beyond by a field of varying size, but generally narrow, of loosely compacted, erect, dusky, reflecting scales." (Scudder, Butt. New Engl. p. 1690.)

vibex, Hübn. ..... 1.
brettus, Boisd. ..... 2.
wingina, Sc.
mystic, Sc. ..... 3.

Confined to North America.

12. Genus Atalopedes.

Atalopedes, Scudd. Syst. Rev. p. 57 (1872). Type, *huron*, Edw.
Pansydia, Scudd. Syst. Butt. p. 60 (1872). Type, *cunaxa*, Hew.

Antennæ short, less than half the length of costa; club short, robust, terminal crook very short. Palpi as in *Hylephila*.

Neuration as in *Hylephila*. "Discal stigma in male consisting of, first, a longitudinal streak at base of middle median interspace, of shining, black, recurved rods; second, of a semilunar field of dead black erect rods in the lowest median interspace, overhung above by long curving scales; followed below by a short, small striga of shining black scales, and outside by a large field of erect loosely compacted scales." (Scudder, Butt. New Engl. p. 1657.)

huron, Edw. ..... 1.
mesogramma, Latr. ♂ ..... 2.
**cunaxa*, Hew. ♀.

I am unable to point out the slightest structural difference between *huron* and *mesogramma*.

Confined to North America.

13. Genus Polites.

Polites, Scudd. Syst. Rev. p. 57 (1872). Type, *peckius*, Kirby.

Antennæ short, less than half the length of costa; club short, robust, terminal crook minute. Palpi as in *Hylephila*.

Neuration as in *Hylephila* except that on the fore wing vein 3 is further from end of cell, being almost equidistant from 2 and 4; and on the hind wing, that vein 2 is nearer to the end of the cell, vein 3 being only slightly nearer to 4 than to 2. "Discal stigma of male consisting of an interrupted, gently arcuate or sinuate streak of dead black retrorse scales or rods edged below, especially in the middle, with a border of similar but dust-coloured erect rods and followed beneath by an inconspicuous large area of loosely compacted, erect, dusky scales." (Scudder, Butt. New Engl. p. 1679.)

coras, Cram. ♀.
peckius, Kirby. ♀.
wamsutta, Harris. ♂.

Confined to North America.

14. Genus Hylephila.

Hylephila, Billb. Enum. Ins. p. 81 (1820).
Type, *phylæus*, Drury.

Euthymus, Scudd. Syst. Rev. p. 56 (1872).
Type, *phylæus*, Drury.

Antennæ very short, hardly one third the length of costa; club short, robust, terminal crook exceedingly minute. Palpi: second joint densely scaled, third joint minute, suberect, bluntly conical.

Fore wing: inner margin slightly longer than outer margin. Cell less than two-thirds the length of costa; vein 5 from close to bottom of cell; vein 3 very close to end of cell; vein 2 considerably nearer to base of wing than to end of cell, in the female this vein is slightly more remote from base of wing. Hind wing: outer margin even, slightly excised between veins 3 and 1 *b*; vein 7 well before end of cell, almost equidistant from 6 and 8; discocellulars faint; vein 5 not traceable; veins 2, 3, and 4 all close together, 3 about twice as far from 2 as from 4. Hind tibiæ with two pairs of spurs. Male with a linear discal stigma on fore wing, extending from origin of vein 3 as far as vein 1, and edged exteriorly with an outwardly diffused streak of raised scales.

phylæus, Drury ..... 1.
fasciolata, Blanch. ... 2.
fulva, Blanch. ..... 3.

Confined to America.

15. Genus Padraona.

Padraona, Moore, Lep. Ceyl. vol. i. p. 170 (1881).
Type, *mæsa*, Moore.

Antennæ: club moderate, elongate, with a short terminal crook. Palpi: second joint densely scaled; third joint short, slender, suberect, obtusely conical.

Fore wing: inner margin longer than outer margin; cell less than two-thirds the length of costa; middle discocellular about twice as long as lower; vein 5 considerably nearer to 4 than to 6; vein 3 immediately before end of cell; vein 2 almost equidistant from end of cell and base of wing, slightly nearer to end of cell. Hind wing: outer margin even, slightly excised between veins 2 and 1 *b*; vein 7 well before the end of cell; discocellulars very faint, vein 5 wanting; vein 3 close to end of cell, twice as far from 2 as from 4; vein 2 considerably nearer to end of cell than to base of wing. In the males of some of the species there is a short and very inconspicuous glandular streak, situated immediately above the centre of vein 1 on the upperside of the fore wing. Hind tibiæ with two pairs of spurs.

goloides, Moore	1.	*flava*, Murray	7.
gola, Moore	2.	*angustula*, H.-S.	8.
dava, Kollar	3.	*coroller*, Boisd	9.
maesa, Moore.		*epictetus*, Fabr.	10.
pseudomaesa, Moore	4.	*palmarum*, Moore	11.
**maesoides*, Butler	5.	*prasias*, Felder	12.
sunias, Felder	6.		

And twelve unidentified species.

This genus is apparently confined to the Asiatic and Australian regions, with the exception of *coroller* from Madagascar, and *epictetus* from tropical America; these two species are possibly not correctly assigned to *Padraona*, though I am unable to point out how they can be separated from it.

There is an Australian genus closely allied to *Padraona* which is represented in the British Museum collection by *marnas*, Felder, *lascivia*, Rosenstock, and four unidentified species. This genus differs from *Padraona* in its much broader wings, slightly different neuration, and in the male in some species being provided with a linear discal stigma on the fore wing.

16. Genus Telicota.

Astycus, Catal. Frank. p. 185 (1825). Type, *augias*, Linn.
Telicota, Moore, Lep. Ceyl. vol. i. p. 169 (1881).
Type, *augias*, Linn.

Antennæ: club stout, elongate, terminal crook short. Palpi: second joint laxly scaled, third joint suberect, bluntly conical. Fore wing: inner margin longer than outer margin; cell less than two-thirds the length of costa; vein 5 close to bottom of cell. In the male; vein 3 is well before the end of cell, considerably nearer to vein 2 than to 4, and vein 2 is nearer to the end of the cell than to the base of the wing. In the female vein 3 is immediately before the end of the cell, and vein 2 is nearer to the base of the wing than to the end of the cell. Hind wing: vein 7 well before the end of cell, the upper margin of cell being bent downwards at its origin; discocellulars faint; vein 5 not traceable; veins 2, 3, and 4 all close together; vein 3 about twice as far from 2 as from 4. Hind tibiæ with two pairs of spurs. Male with a linear discal stigma on the

upperside of the fore wing, extending from the base of vein 4 to as far as the submedian, being twice interrupted at veins 2 and 3.

angias, Linn. ..... 1.
bambusæ, Moore ..... 2.
augiades, Felder ..... 3.
eurotas, Felder ..... 4.
**moseleyi*, Butl. ..... 5.

And three unnamed species.

Scott, in his 'Australian Lepidoptera,' has figured what he identifies as the two sexes of *phineus*, Cramer; the male figured is the female of *augiades*, and the female appears to be a bad figure of *Padraona prusias*, Felder. The true *phineus*, described from Surinam, is in the British Museum from Ecuador and Bolivia, and is the type of a distinct genus. Mr. Butler has also wrongly identified *phineus* and records it from Amboina.

Hübner's name *Astycus* has not been adopted for this genus, as it has never been characterized, and was only published in a sale-list of Frank's collection: the twenty-two species enumerated under it belong to at least thirteen different genera.

This genus ranges from India to Australia.

17. Genus Augiades. (Plate II. fig. 6.)

Augiades, Hübn. Verz. 112 (1816). Type, *sylvanus*, Esper.

Antennæ: club robust, elongate, terminal crook short. Palpi: second joint laxly scaled, third joint short, obtusely conical. Fore wing: inner margin slightly longer than outer margin; cell less than two-thirds the length of costa; vein 5 from close to bottom of cell; vein 3 immediately before the end of cell; vein 2, in male considerably, in female slightly nearer to base of wing than to end of cell. Hind wing: vein 7 well before the end of cell; discocellulars faint; vein 5 not traceable; vein 3 immediately before the end of cell, many times farther from 2 than from 4; vein 2 considerably nearer to end of cell than to base of wing. Hind tibiæ with a long fringe and with two pairs of spurs. Male with a linear discal stigma on fore wing extending from origin of vein 3 to as far as vein 1.

sylvanus, Esper ..... 1.
herculea, Butler ..... 2.
venata, Bremer ..... 3.

And one unidentified species.

18. Genus Phemiades.

Phemiades, Hübn. Verz. p. 112 (1816). Type, *phineus*, Cramer.

Antennæ rather long; club slender, elongated, with a short terminal crook. Palpi: second joint densely scaled, third joint minute. Fore wing very little produced at apex; inner and outer margins subequal; cell less than two-thirds the length of costa. Fore wing: vein 5 close to bottom of cell; vein 3 immediately before end of cell; vein 2 considerably nearer to base of wing than to end of cell.

Hind wing broadly rounded; outer margin very slightly excised at vein 2; vein 7 well before end of cell; discocellulars faint; vein 5 hardly traceable; vein 3 immediately before end of cell; vein 2 well before end of cell, nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs and with a long fringe of coarse hairs. No secondary sexual characters on wings.

phineus, Cramer ..... 1.
nutha, Hew. ..... 2.

And an unidentified species.

Confined to tropical South America and the West Indies.

19. Genus Gegenes. (Plate III. fig. 30.)

Gegenes, Hübn. Verz. p. 107 (1816). Type, *pygmæus*, Hübn.
Philoodus, Ramb. Faune Ent. Andal. ii. p. 308 (1840). Type, *nostrodamus*, Fabr.

Antennæ very short, hardly a third the length of costa; club robust, short, terminal crook minute. Palpi: third joint hardly visible. Fore wing: outer margin longer than inner margin; cell less than two-thirds the length of costa; vein 5 from close to bottom of cell; vein 3 immediately before end of cell; vein 2 nearer to end of cell than to base of wing. Hind wing rather elongated; outer margin even, slightly excised between veins 2 and 1 *b*; vein 7 well before the end of cell; discocellulars faint; vein 5 not traceable; veins 2, 3, and 4 very close together; vein 3 about twice as far from 2 as from 4; lower margin of cell angled at vein 2. Hind tibiæ with two pairs of spurs. No secondary sexual characters on the wings of the male except in a single specimen of an unidentified species in the British Museum from Victoria Nyanza, in which there is a large ill-defined rounded spot of appressed scales on the upperside of the fore wing below end of cell.

nostrodamus, Fabr. ..... 1.
pygmæus, Hübn. (nec Fabr.).
pumilio, Hoffm.
lefebrii, Ramb.

karsana, Moore ..... 2.
hottentota, Latr. ..... 3.
letterstedti, Wallgr.

And one unidentified species.

Ranges over the Mediterranean region, India, and Africa.

20. Genus Calpodes.

Calpodes, Hübn. Verz. p. 107 (1816). Type, *ethlius*, Cram.

Antennæ: club stout; terminal crook rather long, about half the length of the rest of club. Palpi: second joint densely scaled, pressed close against the face; third joint almost entirely concealed. Fore wing: costa nearly straight; inner margin slightly longer than outer margin; cell less than two-thirds the length of costa; vein 12 reaching costa well before end of cell; middle discocellular inwardly oblique, considerably longer than lower one; vein 5 considerably nearer to 4 than to 6; vein 3 shortly before end

of cell, curved strongly downwards; vein 2 slightly nearer to end of cell than to base of wing. Hind wing conspicuously lobate; vein 7 well before end of cell; discocellulars outwardly oblique; veins 2, 3, and 4 all close together; vein 3 nearer to 4 than to 2; lower margin of cell slightly angled at vein 2, more conspicuously at vein 3. Hind tibiæ with two pairs of spurs. No secondary sexual characters on fore wing of male.

ethlius, Cram. ..... 1.
nero, Fabr. ..... 2.
ocola, Edw. ..... 3.
nycteleus, Latr. ..... 4.
ares, Felder ..... 5.
ochramus, Cram. ..... 6.
brino, Cram. ..... 7.
epitus, Cram. ..... 8.
evadnes, Cram. ..... 9.
agita, Hew. ..... 10.
lutetia, Hew. ..... 11.

And four unidentified species.
Tropical American.

21. Genus Parnara. (Plate III. fig. 29.)

Parnara, Moore, Lep. Ceyl. vol. i. p. 166 (1881).
Type, *guttatus*, Brem.
Chapra, Moore, Lep. Ceyl. vol. i. p. 169 (1881).
Type, *mathias*, Fabr.

Antennæ: club short and stout, terminal crook very short, tip acuminate. Palpi as in *Baoris*. Fore wing: inner margin longer than outer margin; cell less than two-thirds the length of costa; vein 12 reaching costa well before end of cell; upper discocellular minute, middle very long, lower very short; vein 5 from close to bottom of cell; neuration entirely as in *Baoris*. Hind tibiæ with two pairs of spurs. Male in some species with a linear discal streak on the fore wing, situated obliquely between veins 2 and 1.

Section A.—Male with a discal stigma.

mathias, Fabr. ..... 1.
mohopaani, Wllgr.
**aqua*, Moore ..... 2.
**chaya*, Moore.
prominens, Moore 3
mencia, Moore ..... 4.

Section B.—No discal stigma in male.

borbonica, Boisd. ..... 5.
marchalii, Boisd. ..... 6.
pontieri, Boisd. ..... 7.
** flexilis*, Swinhoe ..... 8.
bada, Moore ..... 9.
guttatus, Brem. ..... 10.
**mangala*, Moore.

The sole difference between the two genera *Chapra* and *Parnara* is the presence or absence of the sexual streak of the fore wing, a character which is certainly of no value in this genus, as it would assign two such closely allied species as *borbonica* and *mathias* to two separate genera.

This genus is closely allied to *Baoris*, from which it may be separated by the shape of the antennal club.

African and Asiatic.

22. Genus Baoris. (Plate III. fig. 28.)

Baoris, Moore, Lep. Ceyl. vol. i. p. 165 (1881).

Type, *oceia*, Hewitson.

Parnara auctorum (part.).

Antennæ: club moderate, elongate, with a short terminal crook; tip acuminate. Palpi: second joint densely scaled, third joint almost entirely concealed. Fore wing: inner and outer margins subequal; cell less than two-thirds the length of costa; vein 12 reaching costa well before the end of cell; upper discocellular minute, middle discocellular very long, lower very short; vein 5 from close to bottom of cell; vein 3 slightly curved at its base, close to end of cell, twice as far from 2 as from 4; vein 2 considerably nearer to end of cell than to base of wing. Hind wing elongated; outer margin even; vein 7 well before end of cell; discocellulars outwardly oblique; vein 5 not traceable; veins 2, 3, and 4 all very close together; vein 3 twice as far from 2 as from 4; the lower margin of cell bent upwards at vein 2. Hind tibiæ with two pairs of spurs. Male in the type species with a tuft of long hairs on the upperside of the hind wing, attached along the upper margin of the cell and directed downwards across the cell. This character is not found in any other species of the genus.

**oceia*, Hew. ♂ ..... 1.
sikkima, Swinhoe. ♂ ♀.
scopulifera, Moore. ♂ ♀.
unicolor, Moore. ♂ ♀.
penicillata, Moore. ♂.
farri, Moore. ♀.
** kumara*, Moore ..... 2.
** seriata*, Moore ..... 3.
** moolata*, Moore ..... 4.
austeni, Moore ..... 5.
fatuellus, Hopff. ..... 6.
assamensis, Wood-Mason, de Nicéville ..... 7.
narooa, Moore ..... 8.
contigua, Mab. ..... 9.
pagana, de Nicéville ..... 10.
toona, Moore ..... 11.
** eltola*, Hew. ..... 12.
inconspicua, Bert. ..... 13.
** jansonensis*, Bert. ..... 14.
pellucida, Murray ..... 15.
** marsena*, Hew. ..... 16.
uma, de Nicéville ..... 17.
** cormasa*, Hew. ..... 18.
colaca, Moore ..... 19.
cingalensis, Moore.
bevani, Moore ..... 20.
zelleri, Led. ..... 21.
** umbrata*, Butl. ..... 22.

African and Asiatic.

23. Genus Lerodea.

Lerodea, Scudd. Syst. Rev. p. 59 (1872). Type, *eufala*, Edw.

Antennæ: club robust, slightly elongate; antennal crook short. Palpi: second joint densely scaled; third joint erect, minute, bluntly conical. Fore wing: outer margin longer than inner margin; cell less than two-thirds the length of costa; vein 5 from close to bottom of cell; vein 3 immediately before the end of cell; vein 2 almost equidistant from end of cell and base of wing. Hind wing: vein 7 shortly before the end of cell; discocellulars faint; vein 5 not traceable; vein 3 immediately before end of cell; vein 2 well before end of cell, but considerably nearer to it than to the base of the wing. No secondary sexual characters on fore wing of male. Hind tibiæ with two pairs of spurs.

eufala, Edw. ..... 1. | *fusca*, Grote & Robinson ... 2.

Confined to North America.

24. Genus Limochores.

Limochores, Scudd. Syst. Rev. p. 59 (1872).

Type, *manataaqua*, Scudd.

Antennæ: club robust, rather elongate; terminal crook short. Palpi: third joint erect, short, bluntly conical. Fore wing: inner and outer margins subequal; cell less than two-thirds the length of costa; vein 5 close to bottom of cell; vein 3 immediately before end of cell; vein 2 nearer to base of wing than to end of cell. Hind wing: vein 7 well before end of cell; discocellulars faint; vein 5 not traceable; vein 3 immediately before end of cell; vein 2 well before end of cell, but considerably nearer to it than to base of wing. Hind tibiæ with two pairs of spurs, and both middle and hind tibiæ conspicuously spined.

Male with a linear discal stigma on upperside of fore wing from origin of vein 3 to as far as vein 1.

manataaqua, Sc. ..... 1.	*bimacula*, Grote & Rob. 3.
cernes, Harris.	*acuminatus*, Sc.
orono, Sc. ..... 2.	*arpa*, Boisd. ..... 4.

Confined to North America.

25. Genus Euphyes.

Euphyes, Scudd. Syst. Rev. p. 69 (1872).

Type, *metacomet*, Harris.

Antennæ: club stout, elongate, with a short terminal crook. Palpi: second joint clothed with laxly-set scales; third joint slender, obtusely conical, projecting well beyond the clothing of the second joint. Fore wing: costa straight; apex rather produced; inner margin considerably longer than outer margin; cell less than two-thirds the length of costa; vein 5 close to bottom of cell; vein 3 shortly before end of cell; vein 2 nearer to base of wing than to end of cell. Hind wing: outer margin even; vein 7 well before end of cell; vein 3 immediately before end of cell; vein 2 considerably nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs. Male with a linear glandular streak on fore wing extending from base of vein 3 to as far as vein 1.

metacomet, Harris.

Confined to North America.

26. Genus Oligoria.

Oligoria, Scudd. Syst. Rev. p. 61 (1872). Type, *maculata*, Edw.

Antennæ: club robust, elongate, with a short terminal crook. Palpi: third joint minute, obtusely conical, almost entirely concealed. Fore wing hardly produced at apex; inner and outer margins subequal; cell less than two-thirds length of costa; vein 5 from close to bottom of cell; vein 3 very close to end of cell; vein 2 nearer to base of wing than to end of cell. Hind wing: outer margin even, very slightly excised at vein 2; vein 7 well before end of cell, only slightly nearer to 6 than to 8; discocellulars and vein 5 barely traceable; vein 3 immediately before end of cell; vein 2 more

than twice as far from base of wing as from end of cell. Hind tibiæ with two pairs of spurs. No sexual characters on the wings.

maculata, Edw.

Habitat. Southern U.S.

27. Genus Gehenna, nov.

Type, *abima*, Hew.

Antennæ and palpi as in *Halpe*. Fore wing: inner and outer margins subequal, rather produced at apex; cell less than two-thirds the length of costa; middle discocellular more than twice the length of lower one; vein 5 from close to bottom of cell; vein 3 well before end of cell; vein 2 close to base of wing. Hind wing slightly elongated; outer margin even; costa very prominently arched at base; vein 7 shortly before end of cell; discocellulars faint; vein 5 not traceable; vein 3 close to end of cell, twice as far from 2 as from 4; vein 2 considerably nearer to end of cell than to base of wing; lower margin of cell not angled at veins 3 or 2. Hind tibiæ with a long fringe and with two pairs of spurs.

Male with two glandular streaks on the underside of fore wing, the lower along vein 2 at its origin and the upper immediately above it on the lower margin of cell, and there is also a tuft of hairs affixed to the inner margin at extreme base of the wing and directed upwards.

* *abima*, Hew.

Habitat. Macassar.

28. Genus Actinor, nov.

Type, *radians*, Moore.

Antennæ and palpi as in *Halpe*. Fore wing: shape and neuration as in *Halpe*, except that vein 2 of the fore wing is very remote from 3, being nearer to the base of wing than to the end of cell, while in *Halpe* it is considerably nearer the end of cell. Hind wing: cell extending more than half across wing; vein 7 close to end of cell, arising at an acute angle; discocellulars faint; vein 5 distinctly traceable; vein 3 immediately before end of cell; vein 2 considerably nearer to end of cell than to base of wing. No secondary sexual characters on wings; lower margin of cell not angled at veins 2 or 3.

radians, Moore.

The type came from N.W. Himalayas.

29. Genus Halpe. (Plate II. figs. 3, 4.)

Halpe, Moore, Proc. Zool. Soc. 1878, p. 689. Type, *beturia*, Hew.

Antennæ: club moderate, elongate, with a short apical crook, tip acuminate. Palpi porrect; third joint minute, obtusely conical. Fore wing: inner margin longer than outer margin; cell of fore wing less than two-thirds the length of costa; vein 12 reaching costa before the end of cell; upper discocellular about twice the length of lower; vein 5 considerably nearer to 4 than to 6; vein

3 well before end of cell, about equidistant from 2 and from 4; vein 2 nearer to end of cell than to base of wing. Hind wing evenly rounded; cell very short; vein 7 well before end of cell, at its origin vein 7 is sharply bent upwards, and the upper margin of the cell is bent downwards so that the angle is shaped like a tuning-fork; discocellulars faint; vein 5 not traceable; vein 3 from end of cell; vein 2 very much nearer to end of cell than to base of wing; lower margin of cell slightly angled at vein 2. The above is the neuration of the male; in the female vein 3 of the fore wing is slightly nearer to end of cell, and on the hind wing vein 7 arises at an acute angle with the upper margin of cell. Hind tibiæ slightly fringed and with two pairs of spurs. In most species the male is provided with a linear discal stigma on the fore wing, running obliquely from the origin of vein 3 almost to the inner margin. In those species in which there is no discal stigma, the neuration of both wings of the male agrees with that of the female.

**beturia*, Hew.	1.	*gupta*, de N.	8.
**moorei*, sp. n.	2.	*zema*, Hew.	9.
**homolea*, Hew. / *sikkima*, Moore.	3.	*brunnea*, Moore	10.
**cerata*, Hew.	4.	*astigmata*, Swinhoe	11.
varia, Murray	5.	*honorei*, de N.	12.
sitala, de N.	6.	*decorata*, Moore	13.
ceylonica, Moore	7.	**masoni*, Moore	14.

Of the above species, *astigmata*, *honorei*, and *masoni* are without the discal stigma, and it is very short and inconspicuous in *decorata*. Similar differences in the neuration of the male and the female are found in the Asiatic genera *Pithauria* and *Aëromachus*, in both of which the male when it has no discal stigma agrees with the female in neuration, but when provided with a discal stigma differs from the female in the position of vein 3 of the fore wing and in the distortion of the bifurcation of vein 7 of the hind wing.

Confined to Southern Asia and Japan.

HALPE MOOREI, sp. nov.

H. beturia auctorum, *nec* Hewitson.

Above dark brown. Fore wing: male with seven transparent white spots—two in cell, sometimes united, three subapical, and two on disk; the female has an additional opaque white spot at the centre of submedian. Hind wing with the disk suffused with paler yellowish. Cilia: fore wing grey, chequered with brown at end of veins; hind wing uniform greyish. Underside: fore wing with spots as above and with an additional row of six or seven submarginal greyish-white spots between the veins, running parallel to the outer margin; costa, apex, and greater part of outer margin suffused with yellowish scales. Hind wing with a conspicuous transverse white band of spots extending across wing just beyond cell from outer angle as far as submedian, the spot immediately outside cell considerably the largest; a small whitish spot at end of cell, an incomplete submarginal row of whitish spots from anal angle, the two inner ones

prominent, remainder minute. The whole wing more or less dusted with yellowish scales. Tip of antennæ orange-yellow; club and shaft black above, yellowish beneath; palpi dark above, greyish white below.

Expanse, ♂ 34 mm., ♀ 36 mm.

Habitat. India, Burma, Andamans.

This is the species which usually stands in Indian collections as *beturia*, Hew. Hewitson, however, included two distinct species under the name *beturia*, one from Celebes and the other from the Nilgiris; as the former is the one that agrees with his description, it must be taken as the typical one.

The true *beturia* differs from *moorei* in having only four spots on the upperside in the male, two discal and two subapical, and the fringe is unicolorous throughout; in what appears to be the female there is an additional minute subapical spot, a minute indistinct spot at upper angle of cell, and the usual spot peculiar to the female on the submedian. On the underside of the hind wing all the spots are much diffused and irrorated with yellow. It is also a considerably larger insect, the male expanding 42 mm., and the female 43 mm.

I have much pleasure in naming this species after Mr. Moore, from whom I have received much assistance in the loan of types and other specimens.

30. Genus Phlebodes.

Phlebodes, Hübn. Verz. p. 107 (1816). Type, *pertinax*, Cram.

Antennæ: club slender, elongated, terminal crook short. Palpi: second joint densely scaled; third joint minute, bluntly conical. Fore wing: inner and outer margins subequal; cell less than two-thirds the length of costa; vein 5 from close to bottom of cell; vein 3 immediately before the end of cell; vein 2 slightly nearer to end of cell than to base of wing. Hind wing: vein 7 shortly before end of cell; discocellulars faint; vein 5 not traceable; veins 2, 3, 4 all close together; vein 3 about twice as far from 2 as from 4. Hind tibiæ with two pairs of spurs. Male with a linear glandular streak on upperside of fore wing.

pertinax, Cram.

Confined to South America.

31. Genus Poanes.

Poanes, Scudd. Syst. Rev. p. 55 (1872).
Poanes, Scudd. Butl. New Engl. vol. ii. p. 1592 (1889).
Type, *massasoit*, Scudd.

Antennæ rather short; club robust, arcuate, tip acuminate. Palpi: second joint clothed with long laxly-set scales; third joint slender, cylindrical, short, bluntly pointed. Fore wing: costa nearly straight, outer margin convex, slightly shorter than inner margin; cell less than two-thirds the length of costa; vein 12 reaching costa well before end of cell; middle discocellular considerably longer than lower one; vein 5 considerably nearer to

4 than to 6; vein 3 shortly before end of cell; vein 2 almost equidistant from end of cell and base of wing. Hind wing: outer margin even; vein 7 very close to end of cell; discocellulars faint; vein 5 not traceable; vein 3 immediately before end of cell; vein 2 nearer to end of cell than to base of wing. Hind tibiæ with two pairs of rather long spurs. No secondary sexual characters on wings of male.

massasoit, Sc.

32. Genus Phycanassa.

Phycanassa, Scudd. Syst. Rev. p. 56 (1872).
Phycanassa, Scudd. Butl. New Engl. vol. ii. p. 1600 (1889).
Type, *viator*, Edw.

Antennæ short; club straight, with a short terminal crook. Palpi much as in *Poanes*, comparatively longer. Neuration of fore wing as in *Poanes*, except that vein 2 is perceptibly nearer to base of wing than to end of cell. Hind wing: outer margin slightly excised between veins 3 and 1*b*; vein 7 well before end of cell; vein 3 from end of cell; vein 2 considerably nearer to end of cell than to base of wing. Hind tibiæ with two pairs of rather long spurs.

viator, Edw.

Confined to North America.

33. Genus Atrytone.

Atrytone, Scudd. Syst. Rev. p. 56 (1872). Type, *iowa*, Scudd.

Antennæ: club robust, rather elongate, terminal crook short. Palpi: second joint laxly scaled; third joint minute, bluntly conical. Fore wing: inner margin longer than outer margin; cell less than two-thirds the length of costa; vein 5 from close to bottom of the cell; vein 3 very close to end of cell; vein 2 considerably nearer to base of wing than to end of cell. Hind wing evenly rounded; vein 7 shortly before end of cell; discocellulars faint; vein 5 not traceable; vein 3 from end of cell; vein 2 nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs. No sexual characters on wings.

iowa, Sc. ..... 1.
zabulon, Boisd. ..... 2.
hobomok, Mourr.

var. *pocahontas*, Sc.
quadragina, Sc.
logan, Edw. ..... 3.
delaware, Edw.

And two unidentified species.
Confined to America.

34. Genus Cupitha.

Cupitha, Moore, Journ. As. Soc. Beng. pt. ii. 1884, p. 47.
Type, *tympanifera*, Moore.

Antennæ: club moderate, straight, with a short terminal crook, tip acuminate. Palpi: second joint densely scaled; third joint minute, obtusely conical. Fore wing: inner margin [in ♂] convex towards

the base, subequal to outer margin; cell less than two-thirds the length of costa; vein 12 reaching costa before end of cell; middle discocellular considerably longer than lower one; vein 5 considerably nearer to 4 than to 6; vein 3 well before end of cell; vein 2 slightly nearer to base of wing than to end of cell. Hind wing: outer margin even; vein 7 immediately before end of cell; discocellulars faint; vein 5 not traceable. Female: veins 2, 3, and 4 all close together; vein 3 about equidistant from 2 and 4; vein 2 more than twice as far from base of wing as from end of cell. Male: with a circular glandular patch on hind wing at origin of vein 2, distorting the lower margin of cell, and altering the relative positions of veins 2, 3, and 4. The male is also furnished with a short tuft of hair attached to the underside of the fore wing close to the origin of vein 1.

purreea, Moore.
tympanifera, Moore.

These two forms occur together in Burma, Sikhim, and the Nilgiris, and the differences between them appear too slight to justify their separation.

35. Genus Onryza, nov. (Plate II. fig. 5.)

Type, *meiktila*, de N.

Antennæ and palpi as in *Halpe*. Fore wing: inner margin considerably longer than outer margin; cell less than two-thirds the length of costa; vein 12 reaching costa well before end of cell; middle discocellular considerably longer than lower one; vein 5 nearer to bottom of cell than to vein 6; vein 3 well before end of cell, about equidistant from 2 and 4; vein 2 nearer to end of cell than to base of wing. Hind wing: outer margin evenly rounded; vein 7 well before end of cell, straight, upper margin of cell curving downwards at the bifurcation; discocellulars outwardly oblique; vein 5 not traceable; veins 2, 3 and 4 all close together, lower margin of cell bent upwards at vein 2. Hind tibiæ with two pairs of spurs, the upper pair minute. Male with a patch of long recumbent hairs on the upperside of the hind wing, attached along vein 8 from close to the base of the wing.

meiktila, de N.

Habitat. Burma.

36. Genus Notocrypta.

Notocrypta, de Nicéville, Journ. Bomb. Nat. Hist. Soc. iv. p. 188 (1889). Type, *curvifascia*, Felder.

Plesioneura, Felder, Wien. ent. Monat. vi. p. 29 (1862), nom. præoc. Type, *curvifascia*, Felder.

Antennæ: club moderate, with a short terminal crook. Palpi: second joint densely scaled; third joint almost concealed, bluntly conical. Fore wing: inner and outer margins subequal; cell less than two-thirds the length of costa; vein 12 reaching costa almost opposite

end of cell; discocellulars suberect, the middle one considerably the longer; vein 5 much nearer to 4 than to 6; vein 3 close to end of cell; vein 2 considerably nearer to base of wing than to end of cell. Hind wing: outer margin even; vein 7 close to end of cell, more than twice as far from 8 as from 6; discocellulars and vein 5 very faint; vein 3 immediately before end of cell; vein 2 nearer to end of cell than to base of wing; lower margin of cell inconspicuously angled at vein 2. Hind tibiæ with two pairs of long spurs.

curvifascia, Felder	1.	* *albifascia*, Moore	4.
restricta, Moore	2.	* *insulata*, Butler	5.
feisthamelii, Boisd.	3.	* *proserpina*, Butler	6.
alysos, Moore.		*basiflava*, de Nicéville ...	7.

And two unidentified species.

The *curvifascia* of Felder has been identified by some authors as identical with *alysos*, Moore; however, this does not seem to be the case, as in *alysos* there is an opaque white spot above the transparent white band on the underside of the fore wing, which is wanting in typical Chinese specimens of *curvifascia*. This latter species is therefore nearer to *restricta*, Moore, from which it may be distinguished by the lowest spot of the discal band being much indented; this, however, may be simply varietal, as the true *restricta* also occurs in China, and the spot above referred to is frequently slightly indented in Indian specimens of that species.

Alysos, Moore, must sink as a synonym of *feisthamelii*, Boisd., of which there are typical specimens in the British Museum which are absolutely inseparable from Indian specimens of *alysos*; this species can be readily identified by the costal opaque spot on the underside of the fore wing.

Ficulnea, Hew. = *signata*, Druce, and *tola*, Hew., are superficially very like species of *Notocrypta*, but their neuration is entirely different, and, as already suggested by Mr. de Nicéville, they require a separate genus.

Notocrypta is confined to Southern Asia.

37. Genus Udaspes.

Udaspes, Moore, Lep. Ceyl. vol. i. p. 177 (1881).

Type, *folus*, Cram.

Antennæ: club moderate, with a short terminal crook. Palpi: second and third joints porrect; third joint minute, bluntly conical. Fore wing: inner margin slightly longer than outer margin; cell less than two-thirds the length of costa; vein 12 reaching costa just before end of cell; discocellulars suberect, the middle one considerably the longer; vein 5 much nearer to 4 than to 6; vein 3 close to end of cell; vein 2 considerably nearer to base of wing than to end of cell. Hind wing: outer margin even; vein 7 immediately before end of cell; discocellulars and vein 5 very faint; vein 3 immediately before end of cell; vein 2 about twice as far from base of wing as from end of cell; lower margin of cell inconspicuously

angled at vein 2. Hind tibiæ almost naked, with two pairs of spurs. No secondary sexual characters on wings.

{*folus*, Cram.
{*cicero*, Fabr.

Confined to Southern Asia.

38. Genus Baracus.

Baracus, Moore, Lep. Ceyl. i. p. 162 (1881).

Type, *vittatus*, Felder.

Antennæ: club moderate, tip recurved, acuminate. Palpi porrect, conspicuous; second joint laxly clothed with long scales; third joint prominent, acuminate. Fore wing: inner margin longer than outer margin; cell less than two-thirds the length of costa; vein 12 reaching costa before end of cell; vein 11 curving upwards and running very close to, though not quite touching, vein 12; middle discocellular considerably longer than lower one; vein 5 much nearer to 4 than to 6, but not from bottom of cell; vein 3 close to end of cell, twice as far from 2 as from 4; vein 2 twice as far from base of wing as from 3, nearer to end of cell than to base of wing. Hind wing evenly rounded; vein 7 immediately before end of cell; vein 5 not traceable; discocellulars faint; vein 3 immediately before end of cell; vein 2 more than twice as far from base of wing as from end of cell. Hind tibiæ fringed and with two pairs of spurs.

vittatus, Felder ..... 1.
subditus, Moore ..... 2.
septentrionum, Wood-Mason, de Nicéville... 3.
lepeletieri, Latr. ..... 4.
tsita, Trim. ..... 5.
inornatus, Trim. ..... 6.

And four unnamed species.

Trimen puts *lepeletieri* and its allies into *Cyclopides*, from which, however, they may be readily distinguished by veins 11 and 12 of the fore wing not anastomosing, and by several minor points of neuration, and also by the formation of their antennæ and palpi.

Confined to Africa and the Oriental region.

39. Genus Astictopterus.

Astictopterus, Felder, Wien. ent. Monat. iv. p. 401 (1860).

Type, *jama*, Felder.

Antennæ: club slender, tip recurved, acuminate. Palpi porrect; third joint short, obtusely conical. Fore wing: inner margin longer than outer margin; cell less than two-thirds the length of costa; vein 12 reaching costa before end of cell; vein 11 curving upwards shortly after its origin and running close to, but not touching, vein 12; middle discocellular considerably longer than lower one; vein 5 much nearer to 4 than to 6, but not from close to bottom of cell; vein 3 well before end of cell, more than twice as far from 2 as from 4; vein 2 slightly nearer to 3 than to base of wing. Hind wing evenly rounded; vein 7 shortly before end of cell; discocellulars and vein 5 very faint; vein 3 shortly before end of cell, twice as far from 2 as from 4; vein 2 nearer to end of cell

than to base of wing. Hind tibiæ naked and with two pairs of long spurs.

jama, Felder ..... 1.
olivascens, Moore ..... 2.
nubilus, Mab. ..... 3.

And one unidentified species.

A very heterogeneous collection of species have been described as belonging to this genus, most of which belong to the genera *Kerana*, *Sancus*, *Koruthaialos*, *Iambrix*, and *Baracus*. Of the remainder, *argenteo-ornatus*, Hew., *croites*, Hew., and *cynone*, Hew., belong to *Hesperilla* or a closely allied genus; *dhanada*, Moore, *aurivittata*, Moore, and *ladana*, Butler, belong to *Celænorrhinus*; while *ornatus*, Brem., and *unicolor*, Brem., belong to *Heteropterus*.

Confined to Southern Asia.

40. Genus Kerana.

Kerana, Dist. Rhop. Mal. p. 402 (1886). Type, *armatus*, Druce.

Antennæ long; club moderate, recurved at tip. Palpi: second joint densely scaled; third joint almost entirely concealed. Fore wing: inner margin longer than outer; cell less than two-thirds the length of costa; vein 12 reaching costa before end of cell; middle discocellular quite twice the length of lower one; vein 5 from close to bottom of cell; vein 3 well before end of cell; vein 2 almost equidistant from vein 3 and base of wing. Hind wing: outer margin evenly rounded; vein 7 shortly before end of cell; discocellulars and vein 5 faint, but not fully developed; vein 5 nearer to 4 than to 6; vein 3 well before end of cell, nearer to 4 than to 2; vein 2 nearer to end of cell than to base of wing. Hind tibiæ clothed with short recumbent scales and with two pairs of spurs.

The male of the type species differs from the other species of the genus in being provided with a patch of appressed scales occupying the entire cell of the hind wing on the upperside, and giving it a velvety appearance, and with a similar ill-defined patch towards the base of the hind wing on the underside. A somewhat similar male character is found in the genus *Trichosemeia*, Holland. The other species of the genus are without secondary male characters.

armatus, Druce ..... 1.
**gemmifer*, Butler ..... 2.
diocles, Moore ..... 3.

The "*Astictopterus*" *inornatus* of Butler also apparently belongs to this genus, but the type is in too bad condition to enable the point to be decided.

Confined to Southern Asia.

41. Genus Katreus, nov.

Type, *johnstonii*, Butler.

Antennæ very long; club slender, recurved, apex acuminate. Palpi as in *Kerana*. Fore wing: inner margin longer than outer margin; cell less than two-thirds the length of costa; vein 12 reaching

costa before end of cell; *upper margin of cell sharply bent downwards at vein* 8; veins 7 and 6 well below the angle; upper discocellular considerably longer than lower; vein 5 much nearer 4 than 6, but not from close to bottom of cell; vein 3 well before end of cell, twice as far from 2 as from 4; vein 2 about equidistant from vein 3 and base of wing. Hind wing evenly rounded; vein 7 well before end of cell; discocellulars and vein 5 faint; vein 3 immediately before end of cell; vein 2 considerably nearer to end of cell than to base of wing. Hind tibiæ in the male only with terminal spurs, the ventral surface thickly set with short spines; the dorsal surface with a long fringe and also a long tuft of hairs attached near the proximal end.

**johnstonii*, Butler.

Allied to *Kerana*.
Confined to Africa.

42. Genus Ancistroides.

Ancistroides, Butler, Trans. Ent. Soc. 1874, p. 436.
Type, *longicornis*, Butler.

Antennæ very long; club slender, recurved, tip acuminate. Palpi as in *Kerana*. Fore wing: inner margin longer than outer margin; cell less than two-thirds the length of costa; vein 12 reaching costa before end of cell; middle discocellular quite twice as long as lower one; vein 5 from close to bottom of cell; vein 3 shortly before end of cell; vein 2 much nearer to base of wing than to vein 3. Hind wing evenly rounded; vein 7 shortly before end of cell; discocellulars and vein 5 barely traceable; vein 3 immediately before end of cell, many times farther from 2 than from 4; vein 2 nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs and slightly clothed with short recumbent scales.

longicornis, Butler ..... 1.
**othonias*, Hew. ..... 2.

This genus is nearest allied to *Kerana*, but differs from it markedly in the position of the median branches of both wings.
Longicornis is from Timor and *othonias* from Borneo.

43. Genus Pirdana.

Pirdana, Distant, Rhop. Mal. p. 376 (1886).
Type, *hyela*, Hewitson.

Antennæ long; club slender, tip recurved, acuminate. Palpi: second joint densely scaled, third joint minute. Fore wing: inner and outer margins subequal; cell less than two thirds the length of costa: vein 12 reaching costa well before end of cell; upper discocellular minute, lower and middle discocellular inwardly oblique, the middle one considerably the longer; vein 3 very close to end of cell; veinlet in cell just beyond vein 3; vein 2 less than twice as far from end of cell as from base of wing. Hind wing: outer margin even, lobe inconspicuous; cell short, not reaching half across wing; vein 7 just before end of cell, more than three times as far from 8 as

from 6; discocellulars outwardly oblique; vein 5 wanting; vein 3 just before end of cell; vein 2 twice as far from base of wing as from end of cell. Hind tibiæ with two pairs of spurs.

* *hyela*, Hew. ..... 1.
ismene, Feld. ..... 2.

Confined to Southern Asia.

44. Genus PARDALEODES.

Pardaleodes, Butl. Ent. Monthl. Mag. vii. p. 96 (1870).

Type, *edipus*, Cram.

Antennæ rather long; club slender, elongate, with a short recurved crook. Palpi: second joint densely scaled, third joint suberect, short, bluntly conical. Fore wing: inner margin longer than outer margin; cell less than two-thirds the length of costa; vein 12 reaching costa almost opposite the end of cell; vein 11 running very close to but not actually touching vein 12 for a portion of its length; middle discocellular half as long again as lower one; vein 5 considerably nearer to 4 than to 6; vein 3 shortly before end of cell, about twice as far from 2 as from 4; vein 2 slightly nearer to end of cell than to base of wing. Hind wing: outer margin evenly rounded; vein 7 shortly before end of cell; discocellulars and vein 5 very faint; vein 3 immediately before end of cell; vein 2 twice as far from base of wing as from end of cell. Hind tibiæ with two pairs of spurs. No secondary sexual characters on the wings.

edipus, Cram. ..... 1.
* *sator*, Doubl., Hew. ... 2.
festus, Mab. ..... 3.
coanza, Plötz ..... 4.

Confined to Africa.

45. Genus CERATRICHIA. (Plate III. fig. 24.)

Ceratrichia, Butler, Cat. Fabr. Lep. p. 274 (1869).

Type, *nothus*, Fabr.

Antennæ very long and slender, almost as long as the body; club slender, elongate, with a short terminal crook, tip acuminate. Palpi: third joint concealed in the clothing of second joint. Fore wing: inner margin longer than outer margin; cell less than two-thirds the length of costa; vein 12 reaching costa almost opposite the end of cell; middle discocellular about twice the length of lower one; vein 5 considerably nearer to 4 than to 6; vein 3 immediately before end of cell; vein 2 nearer to end of cell than to base of wing. Hind wing: outer margin even; vein 7 shortly before end of cell; discocellulars and vein 5 barely traceable; vein 3 immediately before end of cell; vein 2 twice as far from base of wing as from end of cell. Hind tibiæ with two pairs of spurs. No secondary sexual characters on wings of male.

nothus, Fabr. ..... 1.
* *aretina*, Hew. ..... 2.
argyrosticta, Plötz. 3.
phocion, Fabr. ..... 4.
* *flava*, Hew. ..... 5.

And two unidentified species.

This genus is confined to the African region.

46. Genus Plastingia.

Plastingia, Butler, Ent. Mon. Mag. vol. vii. p. 95 (1870).
Type, *flavescens*, Felder.

Antennæ long; club slender, with a recurved terminal crook, tip acuminate. Palpi well separated, second joint densely scaled, third joint minute, obtusely conical. Fore wing: outer margin considerably longer than inner margin; cell less than two-thirds length of costa; vein 12 reaching costa well before end of cell; discocellulars inwardly oblique; middle one considerably longer than lower; vein 5 considerably nearer to 4 than to 6; vein 3 well before end of cell; vein 2 close to base of wing, more than twice as far from end of cell as from base of wing; lower margin of cell slightly arched between veins 2 and 3. Hind wing slightly elongate, outer margin even; vein 7 well before end of cell, only slightly nearer to 6 than to 8; discocellulars faint; vein 5 not traceable; vein 3 well before end of cell, almost equidistant from 2 and 4; vein 2 considerably nearer to end of cell than to base of wing; lower margin of cell slightly angled at vein 2. Hind tibiæ with two pairs of spurs. No secondary sexual characters on wings of male.

flavescens, Felder ..... 1.
callineura, Felder ..... 2.
**latoia*, Hew.
helena, Butler ..... 3.
**litrania*, Hew. ..... 4.
**vermiculata*, Hew. ..... 5.
**tessellata*, Hew. ..... 6.
naga, de N.

And one unnamed species. *Tessellata* differs considerably in neuration from the type and only doubtfully belongs to this genus.

Other species of the genus are *margherita*, Doherty, and *noemi*, de Nicéville.

This genus is confined to Southern Asia.

47. Genus Lerema.

Lerema, Scudd. Syst. Rev. p. 61 (1872).
Type, *accius*, Smith-Abb.

Antennæ: club robust, elongate, with a short terminal crook; second joint of palpi densely scaled; third joint erect, short, obtusely conical. Fore wing: outer margin considerably longer than inner margin; cell of fore wing less than two-thirds the length of costa; vein 12 reaching costa almost opposite the end of cell; middle discocellular more than twice as long as lower discocellular; vein 5 from close to bottom of cell; vein 3 well before end of cell, about three times as far from 2 as from 4; vein 2 considerably nearer to base of wing than to end of cell. Hind wing rather elongate, outer margin even; vein 7 shortly before end of cell; discocellulars very faint; vein 5 not traceable; veins 2, 3, and 4 all close together; vein 3 about twice as far from 2 as from 4; vein 2 considerably nearer to end of cell than to base of wing; lower margin of cell slightly angled at vein 2. Hind tibiæ with two pairs of spurs.

Male with a linear glandular streak on upperside of fore wing extending from the base of vein 3 as far as vein 1.

accius, Sm. Abb. ..... 1.
hianna, Scudd. ..... 2.

Confined to North America.

48. Genus Pithauria.

Pithauria, Moore, P. Z. S. 1878, p. 689. Type, *murdava*, Moore.
Pithauriopsis, W.-Mason & de Nicéville, Journ. As. Soc. Beng. 1886, p. 387. Type, *aitchisoni*, W. M. & de N.

Antennæ: club slender, elongate, with a rather long and very slender terminal crook. Palpi: second joint pressed close against face, third joint minute. Fore wing rather produced at apex, inner and outer margins subequal; cell less than two-thirds the length of costa; vein 12 reaching costa well before end of cell; upper discocellular minute, middle very long, lower very short; vein 5 from very close to bottom of cell; vein 3 equidistant from 2 and 4; vein 2 slightly nearer to end of cell than to base of wing. Hind wing elongated, outer margin even; cell short, not reaching half across wing; vein 7 shortly before end of cell, both veins curved at the bifurcation; discocellulars outwardly oblique; vein 5 not traceable; veins 2, 3, and 4 all very close together, the lower margin of the cell bent upwards at origin of vein 2. Hind tibiæ with two pairs of spurs.

In the male the fore coxæ are conspicuously tufted. The only differences between *Pithauria* and *Pithauriopsis* are that in the latter the male is furnished with a pair of glandular spots on the upperside of the fore wing between veins 1 and 2, and that at the bifurcation of vein 7 of the hind wing the veins composing the fork are more curved; this, however, is a character which for some unknown reason appears to occur in correlation with glandular patches or streaks on the fore wing. The female of *aitchisoni* has not been described, but will almost certainly be found to have the veins at the origin of vein 7 of the hind wing straight, so that vein 7 would arise at an acute angle.

murdava, Moore ..... 1.
stramineipennis, Wood-Mason, de Nicéville ..... 2.
aitchisoni, Wood-Mason, de Nicéville ..... 3.

Confined to the Oriental region.

49. Genus Niconiades.

Niconiades, Hübn. Exot. Schmett. ii. (1816–21).
Gonioloba, Westw. Gen. Diurn. Lep. p. 512. (1852).
} Type, *xanthaphes*, Hübn.

Antennæ rather long; club slender, elongated, with a slender elongated crook. Palpi: second joint densely scaled, pressed close against the face, third joint erect, minute, bluntly pointed. Fore

wing: outer margin longer than inner margin; cell less than two-thirds the length of costa; vein 12 reaching costa almost opposite the end of cell; discocellulars inwardly oblique, middle one very much longer than the lower one; vein 5 very close to bottom of cell; vein 3 shortly before end of cell; vein 2 considerably nearer to base of wing than to end of cell. Hind wing very elongate; vein 7 shortly before end of cell; vein 3 shortly before end of cell, about twice as far from 2 as from 4; vein 2 considerably nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs.

In the male there are three short longitudinal glandular streaks on the upperside of the fore wing, one in the fork of vein 2, the second immediately below vein 2, and the third immediately above vein 1.

xanthaphes, Hübn. ..... 1.
**cydia*, Hew. ..... 2.

Confined to tropical America.

50. Genus Cobalus.

Cobalus, Hübn. Verz. p. 115 (1816). Type, *virbius*, Cram.

Antennæ: club moderate, with a long slender terminal crook. Palpi: second joint very densely scaled, pressed close against the face, third joint minute, obtusely conical. Fore wing: inner margin longer than outer margin; cell less than two-thirds the length of costa; vein 12 reaching costa before end of cell; middle discocellular inwardly oblique, many times longer than the lower one; vein 5 close to bottom of cell; vein 3 shortly before end of cell; vein 2 almost equidistant from end of cell and base of wing. Hind wing rather produced on subcostal area; outer margin excised between veins 3 and 1 *b*; vein 7 well before end of cell; veins 2, 3, and 4 all close together, vein 3 about twice as far from 2 as from 4; vein 2 considerably nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs.

No secondary sexual characters on wings of male.

virbius, Cram. ..... 1.
**physcelia*, Hew. ..... 2.

And an unidentified species.

Confined to South America.

51. Genus Lychnuchus.

Lychnuchus, Hübner, Zutr. iii. p. 24 (1825). Type, *olenus*, Hübn.

Antennæ: club moderate, elongate, terminal crook rather long and slender. Palpi: second joint densely scaled, pressed close against the face, the third joint entirely concealed. Fore wing: costa slightly arched at base, then straight to apex; inner and outer margins subequal; cell less than two-thirds the length of costa; vein 12 reaching costa shortly before end of cell; middle discocellular considerably longer than lower one; vein 5 from close to bottom of cell; vein 3 well before end of cell; vein 2 more

than twice as far from end of cell as from base of wing in the male of the type species, rather farther removed from base in the female of the type and in both sexes of the other species. Hind wing: outer margin excised between veins 3 and 1*b*; vein 7 well before end of cell, only slightly nearer to 6 than to 8; discocellulars faint; vein 5 wanting; vein 3 close to end of cell, about twice as far from 2 as from 4; vein 2 considerably nearer to end of cell than to base of wing; lower margin of cell slightly angled at vein 2, more conspicuously at vein 3. In the male of the type species there are two linear streaks of modified scales on the upperside of the fore wing at the origin of vein 2, running for a short distance along vein 2 and the lower margin of the cell respectively.

olenus, Hübn. ..... 1.
**ozias*, Hew. ..... 2.

The *olenus* of Hübner appears to be identical with *celsus*, Fabr.
Confined to South America.

52. Genus Carystus.

Carystus, Hübn. Verz. p. 114 (1816). Type, *jolus*, Cram.

Antennæ rather short; club robust, elongate, with a long terminal crook. Palpi: third joint almost entirely concealed in the clothing of the second joint. Fore wing produced at apex, inner margin longer than outer margin; cell less than two-thirds the length of costa; vein 5 considerably nearer to 4 than to 6; vein 3 shortly before end of cell. Hind wing: outer margin even, excised between veins 3 and 1*b*; vein 7 well before end of cell; discocellulars faint, vein 5 barely traceable; vein 3 from end of cell; vein 2 more than twice as far from base of wing as from end of cell. Hind tibiæ with two pairs of spurs.

jolus, Cram. ..... 1.
claudianus, Latr. ... 2.
phorcus, Cram. ..... 3.
**marpesia*, Hew. ..... 4.
**bursa*, Hew. ..... 5.

And three unidentified species.
Confined to Central and South America.

53. Genus Lotongus.

Lotongus, Dist. Rhop. Mal. p. 371 (1886). Type, *calathus*, Hew.

Antennæ of moderate length, with a long terminal crook. Fore wing: inner and outer margins subequal; cell less than two-thirds the length of costa; middle discocellular considerably longer than lower one; vein 3 close to end of cell; vein 2 nearer to base of wing than to end of cell, almost equidistant from vein 3 and base of wing. Hind wing: outer margin even; vein 7 well before end of cell; discocellulars and vein 5 faint; vein 3 immediately before end of cell; vein 2 considerably nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs.

**calathus*, Hew.

Habitat. Sumatra.

54. Genus Thracides.

Thracides, Hübn. Verz. p. 105 (1816). Type, *phidon*, Cram.

Antennæ: club elongate, with a long slender terminal crook. Palpi: second joint densely scaled, pressed close against the face; third joint almost entirely concealed, bluntly conical. Fore wing: inner margin longer than outer margin; cell less than two-thirds the length of costa; vein 12 reaching costa almost opposite end of cell; middle discocellular very oblique, lower very short: vein 5 from close to bottom of cell; vein 3 shortly before end of cell; vein 2 almost equidistant from base of wing and end of cell. Hind wing rather elongate, anal angle slightly lobate; vein 7 well before end of cell; discocellulars outwardly oblique; vein 3 close to end of cell, twice as far from 2 as from 4; vein 2 considerably nearer to end of cell than to base of wing; upper margin of cell bent downwards at vein 7; lower margin of cell slightly angled at vein 2, more conspicuously at vein 3. Hind tibiæ with a dense fringe and two pairs of spurs.

Male with a very inconspicuous linear discal stigma on the upperside of fore wing, from just before origin of vein 3 to as far as the submedian, usually more or less incomplete.

phidon, Cramer ..... 1.
**cilissa*, Hew. ..... 2.
**nanea*, Hew. ..... 3.
**cincia*, Hew. ..... 4.
**brasia*, Hew. ..... 5.

There is an undescribed genus closely allied to *Thracides*, including *telmela*, Hew., *cloanthus*, Latr., and others, which appear to mimic species of *Pyrrhopyge*.

Confined to tropical America.

55. Genus Talides.

Talides, Hübn. Verz. p. 106 (1816). Type, *sergestus*, Cram.

Antennæ and palpi as in *Perichares*. Fore wing differs from *Perichares* in not being so much produced apically, in the outer and inner margins being subequal, and in vein 3 being very much nearer to the end of the cell. Hind wing as in *Perichares* but less elongate, being more produced in the subcostal area. Hind tibiæ and femora less densely fringed than in *Perichares*, and the upper pair of spurs are very short. Linear stigma on fore wing of male as in *Perichares*.

sergestus, Cram. ..... 1.
sinon, Cram. ..... 2.
**eudega*, Hew. ..... 3.
**chiomara*, Hew. ..... 4.
**cerymica*, Hew. ..... 5.

Confined to tropical America.

56. Genus Perichares.

Perichares, Scudd. Syst. Rev. p. 60 (1872). Type, *corydon*, Fabr.

Antennæ: club robust, elongated, with a long terminal crook; second joint of palpi very densely scaled, the third joint almost entirely concealed. Fore wing produced at apex, outer margin very much longer than inner margin; cell less than two-thirds the

length of costa; vein 5 considerably nearer to 4 than to 6; vein 3 well before end of cell; vein 2 almost equidistant from vein 3 and base of wing. Hind wing elongate, outer margin even; vein 7 well before end of cell; discocellulars faint, vein 5 not traceable; vein 3 immediately before end of cell; vein 2 twice as far from base of wing as from end of cell; lower margin of cell angled at vein 2. Hind tibiæ with two pairs of spurs. There is a very dense fringe on the hind tibiæ and femora and also on the middle femora.

Male with a linear discal stigma extending from the base of vein 3 to as far as vein 1.

corydon, Fabr. ..... 1.
fulvimargo, Butler..... 2.

Confined to tropical America.

57. Genus Unkana.

Unkana, Dist. Rhop. Mal. p. 369 (1886). Type, *batara*, Dist.

Antennæ long; club moderate, elongated, with a long terminal crook. Palpi: second joint densely scaled, third joint almost concealed. Fore wing produced at apex, outer margin considerably longer than inner margin; cell of fore wing less than two-thirds the length of costa; discocellulars inwardly oblique; vein 5 considerably nearer to 4 than to 6, but not from close to bottom of cell (except in *elia*); vein 3 well before end of cell; vein 2 almost equidistant from vein 3 and base of wing. Hind wing produced in the subcostal area, outer margin even, conspicuously excised between veins 3 and 1*b*; vein 7 well before end of cell; discocellulars and vein 5 very faint; vein 3 well before end of cell, about twice as far from 2 as from 4; vein 2 considerably nearer to end of cell than to base of wing. Hind tibiæ with two pairs of spurs.

batara, Dist. ..... 1.
**attina*, Hew. ..... 2.
**elia*, Hew. ..... 3.
semamora, Moore ... 4.
watsonii, de Nicév. ... 5.

It seems very doubtful if all the above are congeneric. There are no sexual characters on the wings of *batara*, *attina*, or *watsonii*. In the male of *elia* there is a short discal stigma on the upperside of the fore wing extending from the base of vein 3 to just beyond vein 2, and there is also a tuft of hairs on the underside of the fore wing at the origin of vein 1; in *semamora* there is no discal stigma but there is a tuft of hairs similarly situated to that of *elia*. *Semamora*, *watsonii*, and *elia* all differ slightly in neuration from *batara*, and the two former also differ in the crook to the antennæ being very short. All these species, however, seem to be conveniently included under *Unkana* for the present.

Is *batara* identical with *cruda*, H.-S.?

Confined to the Oriental region.

58. Genus Hidari.

Hidari, Dist. Rhop. Mal. p. 395 (1886). Type, *irava*, Moore.

Antennæ long; club robust, elongated, with a long terminal crook. Palpi: second joint very densely scaled, third joint almost entirely

concealed. Fore wing: outer margin longer than inner margin; cell less than two-thirds the length of costa; discocellulars inwardly oblique; vein 5 from close to bottom of cell; vein 3 well before end of cell; vein 2 almost equidistant from end of cell and base of wing. Hind wing slightly lobate, outer margin even; vein 7 well before end of cell; discocellulars and vein 5 faint; veins 2, 3, and 4 all close together; vein 3 almost equidistant from 2 and 4; vein 2 more than twice as far from base of wing as from end of cell. Hind tibiæ with two pairs of spurs, the upper pair short.

irava, Moore.
**hypæpa*, Hew.

Confined to the Oriental region.

59. Genus Pteroteinon, nov.

Tanyptera, Mabille, Bull. Soc. Zool. France, p. 260 (1877), nom. præoc. Type, *laufella*, Hewitson.

Antennæ: club rather robust, about one-third the length of shaft, bent at about a right angle, terminal portion short, about half the length of remainder of club. Palpi: second joint thickly scaled, third joint minute. Fore wing: outer margin longer than inner margin; vein 12 reaching costa before end of cell; veins 6 and 7 from upper end of cell; upper discocellular non-existent; middle discocellular inwardly oblique, angled at its lower end; lower discocellular very short, about half the length of middle one; vein 3 near end of cell, about five times as far from base of wing as from end of cell; vein 2 equidistant from base of wing and from vein 3; veinlet in cell just before vein 4. Hind wing: lobe inconspicuous; vein 7 twice as far from base of wing as from end of cell; discocellulars outwardly oblique; vein 5 well developed; vein 3 just before end of cell; vein 2 three times as far from base of wing as from end of cell. Hind tibiæ with two pairs of spurs, and with a double fringe of densely set setæ.

**laufella*, Hew.

Confined to Africa.

Synopsis of Genera of Pamphilinæ.

Section C.

a. Vein 5 of hind wing well developed.
a'. Vein 3 of hind wing immediately before end of cell.
a^2. Club of antennæ longer than shaft.
Ismene, Swainson. Type, *odipodea*, Swains. (1)
b^2. Shaft of antennæ longer than club.
a^3. Vein 1 of fore wing distorted downwards near base.
Hasora, Moore. Type, *badra*, Moore. (2)
b^3. Vein 1 of fore wing not distorted near base.
Bibasis, Moore. Type, *sena*, Moore. (3)
b'. Vein 3 of hind wing well before end of cell.
Badamia, Moore. Type, *exclamationis*, Fabr. (4)
b. Vein 5 of hind wing wanting.
Rhopalocampta, Wallgr. Type, *forestan*, Cram. (5)

1. Genus Ismene.

(Plates I. figs. 14, 15, 16; II. figs. 11, 12; III. fig. 18.)

Ismene, Swainson, Zool. Ill. vol. i. pl. 16 (1820–21).

Type, *œdipodea*, Swainson.

Antennæ: club very robust, about twice as long as shaft, terminal portion tapering to a fine point and curved into a crescent, never bent into a hook. Palpi as already characterized. Fore wing: inner and outer margins subequal; cell slightly more than half the length of costa; vein 12 reaching costa almost opposite end of cell; vein 5 equidistant from 4 and 6; upper discocellular minute, middle and lower discocellulars subequal, almost erect; vein 3 three times as far from base of wing as from end of cell; vein 2 three times as far from end of cell as from base of wing. Hind wing: cell very short, only reaching about one-third across wing; vein 7 twice as far from 8 as from 6; discocellulars very faint, slightly outwardly oblique; vein 5 well developed; vein 3 just before end of cell; outer margin sinuate but not distinctly lobed. Hind tibiæ slightly fringed, and with two pairs of spurs. The above diagnosis is from a Javan female of typical *œdipodea*, and applies to the females of all other species of the genus.

In the males of all the species the hind tibiæ are much swollen, and have a long tuft of hairs affixed near the proximal end on the upperside, beneath which, along their outer edge, they are clothed with large rounded scales. This character is most fully developed in *mahintha*, and least of all in *harisa*, the other species showing a gradual transition between the two.

In typical *œdipodea* the male has a very prominent rounded patch of appressed scales on the upperside of the fore wing, owing to which the lower margin of the cell is strongly curved upwards, and vein 3 arises near the base of the wing and very close to vein 2. On the hind wing vein 8 is very short, and runs upwards to the costa at a short distance from the base, and, just beyond it, the costal margin is folded over on the upperside. Vein 7 is much as in the female, but vein 6 is strongly curved downwards. The folding over of the costal margin on the upperside gives the wing, as seen from beneath, the appearance of being strongly arched at base and then cut away obliquely to just beyond vein 7.

The above characters occur only in males of typical *œdipodea* from Java and Borneo. In the Indian species, which has hitherto been considered to be identical with *œdipodea* and which I propose to rename *ataphus*, the veins of the fore wing are distorted as in *œdipodea*; but the costa of the hind wing is not folded over, and the neuration of that wing is much as in the female.

The other species of the genus vary considerably in the male mark of the fore wing, which is sometimes very prominent and sometimes entirely absent, and there is also considerable variation in the distortion of the veins of the fore wing. However, the character of the swollen hind tibiæ is invariably present and the females are inseparable, so I have considered it very unadvisable to form new

genera on the male characteristics alone, and subjoin a key to the species of the genus in the collection of the British Museum.

A. Male, costa of hind wing folded over.
  a. Male, conspicuous rounded patch of androconia on the fore wing; vein 3 of fore wing close to base of cell ..... *œdipodea*, Swains. ..... 1.

B. Male, costa of hind wing not folded over.
  a. Male, vein 3 of fore wing close to base of cell.
    a'. Male, conspicuous rounded patch of androconia on fore wing ..... **ataphus*, n. sp. ..... *2.
    b'. Male, inconspicuous rounded patch of androconia on fore wing ..... **amara*, Moore ..... 6.
  b. Male, vein 3 of fore wing about equidistant from end and base of cell.
    a'. Male, with a rounded patch of androconia on fore wing ..... *jaina*, Moore ..... 3.
      fergusonii, de Nicéville . 4.
    b'. Male, with linear streaks of androconia along median branches of fore wing ... **striata*, Hew. ..... 7.
  c. Male, vein 3 of fore wing close to end of cell.
    a'. Male, rounded patch of androconia on fore wing ..... **iluska*, Hew. ..... 5.
    b'. Male, linear streaks of androconia on fore wing ..... *makintha*, Moore ..... 8.
    c'. Male, no patch or streaks of androconia on fore wing ..... **etelka*, Hew. ..... 9.
      **vasutana*, Moore ..... 10.
      anadi, de Nicéville ... 11.
      harisa, Moore ..... 12.
      gomata, Moore ..... 13.
      aquilina, Speyer ..... 14.
      jankowskii, Oberthür.
      **chrysæglia*, Butler.

The species are numbered in what would appear to be their most natural order. The females of all the species have vein 3 of the fore wing close to the end of the cell, as in the last group of the males.

This genus is confined to the Oriental region, China and Japan.

ISMENE ATAPHUS, n. sp.

Ismene œdipodea, Moore (nec Swainson), Lep. Ceyl. vol. i. p. 158, pl. 64. figs. 2, 2 *a*, 2 *b* (1881).

This species is the Indian representative of the Sumatran *œdipodea*, with which it has hitherto been confounded. The male differs from that of *œdipodea* in the costal margin of the hind wing being normal, whereas in *œdipodea* the costal margin is folded over and the costal vein is correlatively distorted. The female has a costal red streak on the upperside of the fore wing which is entirely absent in the female of *œdipodea*. Furthermore, in both sexes of *œdipodea* the thorax and base of wings are conspicuously clothed with long silvery greenish-blue scales; in *ataphus* this clothing is of a duller green and of less extent, especially on the wings. The cilia of the hind wings are also much longer and redder in *ataphus* than in *œdipodea*.

The present species is represented in the British Museum from Ceylon and Silhet, and it also occurs in Hong Kong.

Œdipodea is in the British Museum from Java, Borneo, and Macassar.

2. Genus Hasora. (Plate II. figs. 1, 2.)

Hasora, Moore, Lep. Ceyl. vol. i. p. 159 (1881).
Type, *badra*, Moore.

Parata, Moore, Lep. Ceyl. vol. i. p. 160 (1881).
Type, *chromus*, Moore.

Antennæ: club thickening rather abruptly and gradually tapering to a fine point, bent beyond the thickest portion, usually at about a right angle, but sometimes almost into a hook; the terminal portion not quite so long as the remainder of the club. Fore wing: inner and outer margins subequal; cell less than two-thirds the length of costa; vein 12 reaching costa almost opposite upper angle of cell vein 5 nearer to 6 than to 4; upper discocellular minute; middle and lower discocellulars inwardly oblique and in the same straight line; vein 3 almost equidistant from base of wing and from end of cell; vein 2 nearer to base of wing than to vein 3; vein 1 distorted downwards near base. Hind wing produced into a lobe; vein 7 slightly nearer to 6 than to 8; discocellulars very faint, outwardly oblique; vein 5 well developed, much nearer to 6 than to 4; vein 3 from just before end of cell; vein 2 about equidistant from base of wing and from end of cell. Hind tibiæ not very densely fringed, and with two pairs of spurs.

The female differs in vein 3 of the fore wing being three times as far from base of wing as from end of cell.

The type-species of *Parata* differs from the type-species of *Hasora* in being provided in the male with an oblique discal stigma on the fore wing, and also in some slight differences in the outline of the wings. These two characters, however, exist together only in the type-species of *Parata*, and we find other species with the discal streak of *Parata* and the outline of *Hasora*, or *vice versâ*, while the streak itself appears in every degree of intensity, being sometimes very prominent and at other times barely traceable or altogether absent, the females in all the species being structurally inseparable.

The species represented in the British Museum are divided below into two groups, based on the degree of prominence of the sexual streak, and are numbered in what appears to be their most natural order, which it will be seen does not agree at all with the divisions founded on their sexual brand.

Of *atrox*, *bilunata*, and *lugubris* there are only females in the British Museum; of these the two former probably have a discal stigma in the male, and the last seems very possibly to be the female of *celœnus*.

Other species of the genus are *anura*, de Nicéville, and *hadria*, de Nicéville, both from India, and there are five unidentified species in the British Museum, most of which are probably undescribed.

This genus is represented in the British Museum from throughout India, Malaysia, the Philippines, Fiji, New Guinea, and Australia.

A. Male with sexual streak inconspicuous or absent.

badra, Moore ..... 1.
thridas, Boisd. ..... 3.
vitta, Butl. ..... 6.
coulteri, de Nicév. ..... 7.
discolor, Feld. ..... 11.
doleschallia, Feld. ..... 14.
**myra*, Hew. ..... 18.

B. Male with sexual streak conspicuous.

**atrox*, Butl. ..... 2.
chromus, Cram. ..... 4.
alexis, Fabr. ..... 5.
malayana, Feld. ..... 8.
**bilunata*, Butl. ..... 9.
kurana, Butl. ..... 10.
celænus, Cram. ..... 12.
lugubris, Boisd. ..... 13.
**chuza*, Hew. ..... 15.
schœnherri, Latr. ..... 16.
gentiana, Feld. ..... 17.
**saida*, Hew.

3. Genus Binasis.

Binasis, Moore, Lep. Ceyl. vol. i. p. 160 (1881).
Type, *sena*, Moore.

Antennæ much as in *Hasora*, but the terminal portion of club usually much more hooked. Fore wing: male without costal fold or discal stigma; outer margin longer than inner margin; cell only slightly more than half the length of costa; vein 12 reaching costa almost opposite upper angle of cell; vein 5 slightly nearer to 6 than to 4; upper discocellular minute; middle and lower discocellulars subequal, almost erect, and in the same straight line; vein 3 three times as far from base of wing as from end of cell, more than twice as far from 2 as from 4; vein 2 three times as far from end of cell as from base of wing. Hind wing not so broad as in *Hasora*; lobe less conspicuous; vein 7 nearer to 6 than to 8; discocellulars faint, slightly outwardly oblique, the lower the longer; vein 5 well developed; vein 3 just before end of cell; vein 2 nearer to end of cell than to base of wing. Hind tibiæ not fringed but thickly scaled above, and with two pairs of spurs.

There is only one described species in this genus, which is recorded from India, Ceylon, and Java.

**sena*, Moore.

4. Genus Badamia.

Badamia, Moore, Lep. Ceyl. vol. i. p. 156 (1881).
Type, *exclamationis*, Fabr.

Antennæ short, hardly half the length of costa; club moderate, usually bent into a hook, sometimes only at right angles, tapering to a point. Fore wing without discal stigma; outer and inner margins subequal; cell very long and narrow, more than two-thirds the length of costa; vein 12 reaching the costa before end of cell; vein 5 equidistant from 4 and 6; upper discocellular minute, lower

and middle discocellulars subequal, inwardly oblique, and in the same straight line; vein 3 three times as far from base of wing as from end of cell; vein 2 twice as far from 3 as from base of wing. Hind wing excavated at vein 2 and produced into a prominent lobe; vein 7 nearer to 6 than to 8; middle discocellular slightly outwardly oblique, and lower slightly inwardly oblique; vein 5 well developed; vein 3 well before end of cell; vein 2 about equidistant from end of cell and base of wing. Hind tibiæ fringed, and with two pairs of spurs.

The type species, which is the sole representative of the genus, is of very wide distribution, the series in the British Museum being from localities ranging from Australia to the N.W. Himalayas.

5. Genus Rhopalocampta. (Plate I. fig. 13.)

Rhopalocampta, Wallengren, Rhop. Caffr. p. 47 (1857).
Type, *forestan*, Cram.

Choaspes, Moore, Lep. Ceyl. vol. i. p. 158 (1881).
Type, *benjamini*, Guérin.

Antennæ: club moderate, about as long as shaft, crescent-shaped, not bent into a hook, very similar to those of *Ismene*, but less robust and with a longer shaft. Fore wing: no discal brand in male; inner and outer margins subequal; cell just more than two-thirds the length of costa; vein 12 reaching costa before end of cell; vein 5 nearer to 6 than to 4; upper discocellular minute; lower and middle discocellulars almost erect and in the same straight line, the lower the longer; vein 3 three times as far from base of wing as from end of cell. Hind wing produced into a lobe; vein 7 twice as far from 8 as from 6; discocellulars very faint, almost erect; *vein 5 wanting*; vein 3 from just before end of cell; vein 2 nearer to base of wing than to end of cell. Hind tibiæ with two pairs of spurs, and furnished in the male with a long tuft of hairs attached close to the proximal end, and reaching well beyond the distal end of the tibia.

This genus is confined almost entirely to Africa and the Malay Archipelago, *benjamini* alone being found in India, China, and Japan, while the range of *anchises* extends to Aden.

benjamini, Guérin	1.	*pisistratus*, Fabr.	10.
japonica, Murray.		*valmaran*, Wallgr.	
subcaudata, Felder	2.	**fervida*, Butl.	11.
ramanatek, Boisd.	3.	*keithloa*, Wallgr.	12.
libeon, Druce	4.	*stella*, Trim.	
**jucunda*, Butler	5.	*ratek*, Boisd.	13.
**pansa*, Hew.	6.	*bixæ*, Linn.	14.
anchises, Gerst.	7.	*chalybe*, West.	15.
taranis, Hew.		*juno*, Plötz	16.
forestan, Cram.	8.	*iphis*, Drury	17.
arbagastes, Guén.	9.	*jupiter*, Fabr.	
**margarita*, Butl.		*hanno*, Plötz	18.

The following genera, of which the types are not in the British Museum, I have been unable to identify :—

ÆTHEIUS, Hbn. Verz. 109 (1816) ..	Type, *archytas*, Stoll.
AIDES, Billb. Enum. Ins. 81 (1820) .	Type, *epitus*, Cram.
ALERA, Mab. C. R. Soc. Ent. Belg. lxxxiv. (1891)	Type, *furcata*, Mab.
CALLIMORMUS, Sc. Syst. Rev. 53 (1872)	Type, *juventus*, Sc.
CHORANTHUS, Sc. Syst. Rev. 58 (1872)	Type, *radians*, Lef.
CHORISTONEURA, Mab. Bull. Soc. Ent. Fr. (6) ix. p. clvi (1889)	Type, *apicalis*, Mab.
CŒLIADES, Hbn. Verz. 106 (1816) ..	Type, *dubius*, Cram.
CORONE, Mab. Pet. Nouv. p. 205 (1878)	Type, *ismenoides*, Mab.
CYMÆNES, Sc. Syst. Rev. 61 (1872).	Type, *tripuncta*, H.-S.
ENOSIS, Mab. Bull. Soc. Ent. Fr. (6) ix. p. ix (1889)	Type, *dognini*, Mab.
EXOMETÆCA, Meyr. P. Linn. Soc. N. S. W. (2) ii. p. 833	Type, *nycteris*, Meyr.
GARGA, Mab. Le Nat. ii. p. 216 (1889)	Type, *olena*, Mab.
HEMIPTERIS, Mab. Le Nat. ii. p. 216 (1889)	Type, *fumida*, Mab.
NARGA, Mab. C. R. Soc. Ent. Belg. p. lxx (1891).....	Type, *chiriquensis*, Mab.
NERULA, Mab. Le Nat. ii. p. 255 (1888)	Type, *nautes*, Mab.
NYCTUS, Mab. C. R. Soc. Ent. Belg. p. cxiv (1891)	Type, *crinitus*, Mab.
OARISMA, Sc. Syst. Rev. p. 54 (1872)	Type, *powcshiek*, Pack.
PRAXIS, Mab. Le Nat. ii. p. 25 (1889)	Type, *quadrata*, Mab.
PACHYNEURIA, Mab. Le Nat. ii. p. 275 (1888)	Type, *obscura*, Mab.
PLESIOCERA, Mab. C. R. Soc. Ent. Belg. p. cvi (1891)	Type, *filipalpis*, Mab.
PLOETZIA, Saal. Müll. Lep. Mad. i. p. 115 (1884)	Type, *amygdalis*, Mab.
SYSTOLE, Mab. Lép. Mad. i. p. 330 (1885)	Type, *amygdalis*, Mab.
POTANTHUS, Sc. Syst. Rev. 54 (1872)	Type, *omaha*, Edw.
PRENES, Sc. Syst. Rev. 60 (1872) ..	Type, *panoquin*, Sc.
STETHOTRIX, Mab. Bull. Soc. Ent. Fr. (6) ix. p. clxxxiv (1889)	Type, *heterogyna*, Mab.
TOXIDIA, Mab. C. R. Soc. Ent. Belg. p. lxxx (1891)	Type, *thyrrhus*, Mab.
ZEA, Dist. Rhop. Mal. p. 377 (1886).	Type, *mytheca*, Hew.

The genus *Helias*, subsequently renamed *Achna*, has not been included above, as its type species is unknown.

EXPLANATION OF THE PLATES.

Plate I.

Fig. 1. *Ardaris eximia* (showing veins numbered), p. 13.
2. *Pyrrhopyge charybdis*, p. 11.
3. *Microceris variicolor*, p. 15.
4. *Epargyreus tityrus*, p. 23.
5. *Phocides pigmalion*, p. 21.
6. *Tarsoctenus papias*, p. 21.
7. *Phanus vitreus*, p. 40.
8. *Anisochoria albiplaga*, p. 59.
9. *Tagiades flesus*, p. 53.
10. *Eantis busiris*, p. 57.
11. *Hesperia malvæ*, p. 64.
12. *Caprona ransonnetii*, p. 62.
13. *Rhopalocampta forestan*, p. 129.
14. *Ismene œdipodea*, ♂, p. 125.
15. *Ismene ataphus*, ♂, p. 125.
16. *Ismene ataphus*, ♀, p. 125.

Plate II.

Fig. 1. *Hasora badra*, ♂, p. 127.
2. —— ——, ♀, p. 127.
3. *Halpe moorei*, ♂, p. 108.
4. —— ——, ♀, p. 108.
5. *Onryza meiktila*, ♂, p. 112.
6. *Augiades sylvanus*, ♀, p. 103.
7. *Telesto perronii*, ♂, p. 73.
8. *Koruthaialos hector*, p. 76.
9. *Sancus pulligo*, ♂, p. 87.
10. *Cyclopides metis*, p. 90.
11. *Ismene mahintha*, ♂ (hind leg × 2), p. 125.
12. *Ismene œdipodea*, ♂ (hind leg × 2), p. 125.
13. *Tarsoctenus corytas*, ♂ (hind leg × 2), p. 21.
14. *Eantis busiris*, ♂ (hind leg × 2), p. 57.
15. *Chrysoplectrum otriades*, ♂ (hind leg × 2), p. 24.
16. *Æthilla eleusinia*, ♂ (hind leg × 2), p. 37.

Plate III.

Fig. 1 *a*, *b*. *Pyrrhopyge charybdis* (antenna and palpi × 2), p. 11.
2. *Phocides pigmalion* (antenna and palpi × 2), p. 21.
3. *Eudamus proteus* (antenna and palpi × 2), p. 20.
4. *Plesta dorus* (antenna and palpi × 2), p. 21.
5. *Æthilla eleusinia* (antenna and palpi × 2), p. 37.
6. *Phænicops beata* (antenna and palpi × 2), p. 30.
7. *Bungalotis midas* (antenna and palpi × 1½), p. 28.
8. *Dyscophus sebaldus* (antenna and palpi × 2), p. 27.
9 *a*, *b*. *Entheus talaus* (antenna and palpi × 2), p. 40.
10 *a*, *b*. *Anisochoria albiplaga* (antenna and palpi × 2), p. 59.
11. *Tagiades flesus* (antenna and palpi × 2), p. 53.
12 *a*, *b*. *Camptopleura theramenes* (antenna and palpi × 2), p. 55.
13 *a*, *b*. *Mycteris cærula* (antenna and palpi × 2), p. 56.
14. *Cyclopides metis* (antenna and palpi × 2), p. 90.
15. *Caprona pillaana* (antenna and palpi × 2), p. 62.
16. *Abantis tettensis* (antenna and palpi × 2), p. 63.
17 *a*, *b*. *Eantis busiris* (antenna and palpi × 2), p. 57.
18 *a*, *b*. *Ismene œdipodea* (antenna and palpi × 2), p. 125.
19. *Hesperia malvæ* (antenna and palpi × 3), p. 64.
20. *Taractrocera mævius* (antenna and palpi × 3), p. 94.
21. *Butleria dimidiatus* (antenna and palpi × 2), p. 79.

Fig. 22. *Telesto perronii* (antenna and palpi × 2), p. 73.
23. *Motasingha dirphia* (antenna and palpi × 2), p. 73.
24. *Ceratrichia phocion* (antenna and palpi × 2), p. 117.
25 *a*, *b*. *Iambrix salsala* (antenna and palpi × 2), p. 76.
26 *a*, *b*. *Apaustus menes* (antenna and palpi × 2), p. 96.
27 *a*, *b*. *Adopæa thaumas* (antenna and palpi × 2), p. 98.
28. *Baoris occia* (antenna and palpi × 2), p. 106.
29. *Parnara mathias* (antenna and palpi × 2), p. 105.
30. *Gegenes nostrodamus* (antenna and palpi × 2), p. 104.

2. Descriptions of New Species of Dipterous Insects of the Family *Syrphidæ* in the Collection of the British Museum, with Notes on Species described by the late Francis Walker.—Part I. Bacchini and Brachyopini.

By E. E. Austen, Zoological Department, British Museum.

[Received December 2, 1892.]

(Plates IV. & V.)

The following is intended to be the first of a series of papers on the *Syrphidæ* in the Collection of Diptera in the British Museum. For some time past I have been engaged in working on these Insects, and it was my original intention not to publish anything upon the subject until the re-arrangement of the Family had been completed. But since it has been urged upon me that a saving of time is effected by writing about a group while it is fresh in one's memory, I have decided to begin the preparation of these papers at once. This is the reason why I have commenced in the middle of the Family.

Appended is a list of the species now to be described, with their habitats.

Ethiopian Region.

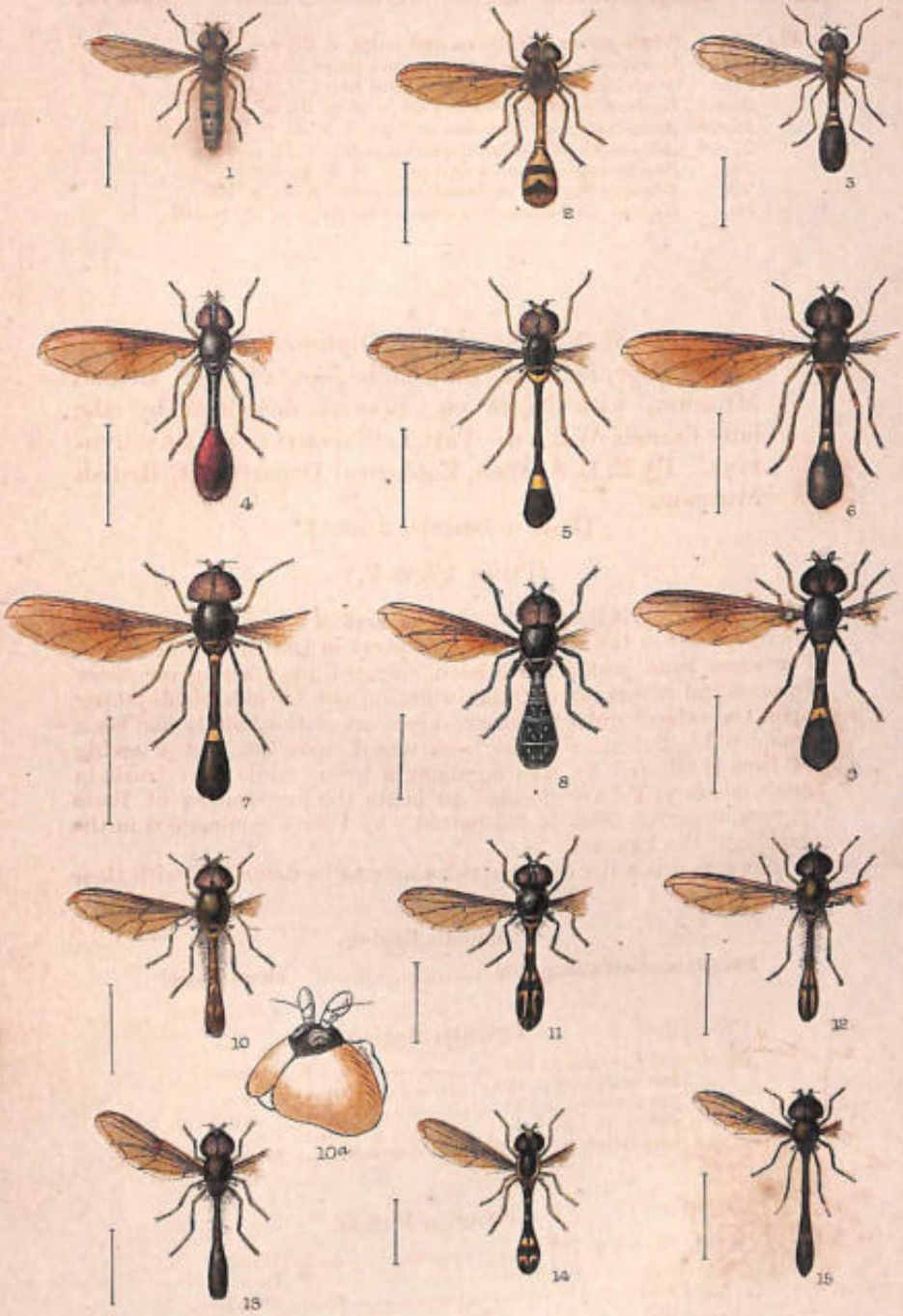
Rhingia semi-cærulea, p. 162	Sierra Leone.

Oriental Region.

Baccha nubilipennis, p. 136	Ceylon.
„ *triangulifera*, p. 138	„
„ *pulchrifrons*, p. 139	„
„ *fallax*, p. 142	„
„ *amphithoe*, p. 142, Wlk. (re-described) ...	Mulmein, Sarawak, Ceylon.

Australian Region.

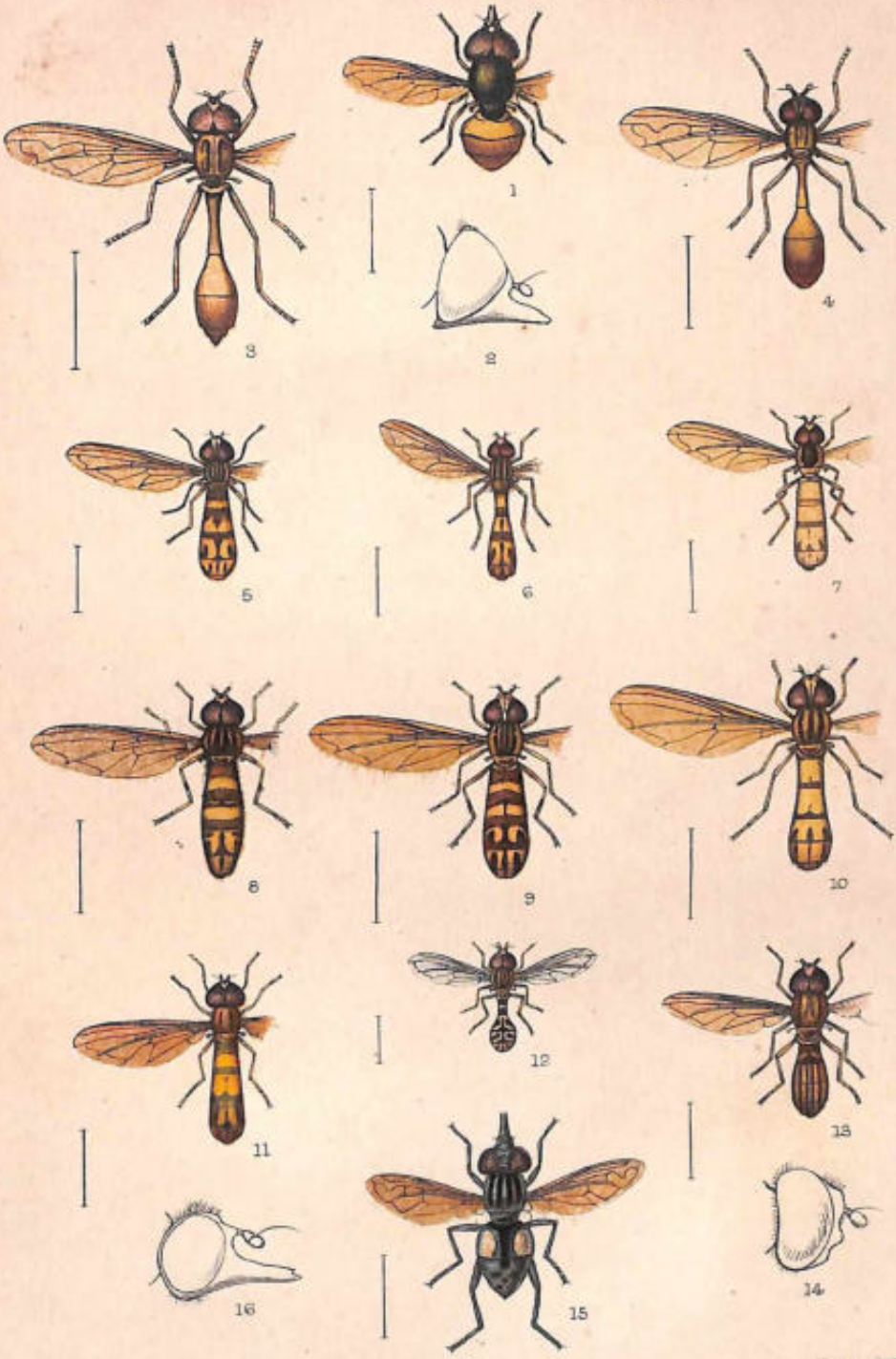
Baccha bicolor, p. 137	Mysol.
„ *refulgens*, p. 138	Bouru.
„ *sulica*, p. 144.....	Sula Is.



Bessean & Highley del. et lith.

West, Newman imp.

New Species of Syrphidæ.



Benjean & Highley del. et lith.

West, Newman imp.

New Species of Syrphidae.

Neotropical Region.

Ocyptamus iris, p. 133	Jamaica.
Baccha sagittifera, p. 144	"
" *signifera*, p. 145	Brazil.
" *levissima*, p. 146	"
" *incompta*, p. 147	"
" *pumila*, p. 148	"
" *silacea*, p. 149	"
" *cultrata*, p. 151	"
" *flavens*, p. 153	"
" *gilva*, p. 154	"
" *crocata*, p. 155	"
" *crocea*, p. 157	"
" *fervida*, p. 158	"
Salpingogaster virgata, p. 159	"
" *minor*, p. 161	"

BACCHINI, Williston.

Synopsis N. Amer. Syrphidæ, Bull. 31, U.S. Nat. Mus. p. xv.

OCYPTAMUS, Macq.

OCYPTAMUS IRIS, sp. n. (Plate IV. fig. 1, ♀.)

♀. Length 7½ mm.

Face and *cheeks* pale yellow; face with a sharply defined metallic bronze median stripe, reaching to the oral margin; vertex bluish purple, front metallic greenish black, pollinose on the sides and in the middle; pile black. Antenniferous projection yellow in front, below. *Antennæ* orange-yellow, brown above; third joint oval. *Thorax* dull purplish black on the dorsum, steely blue on the sides and pleuræ; *scutellum* metallic, bluish in front, bronze-green behind. *Abdomen* metallic iridescent, with dull velvety black markings; first segment magenta, brilliant steel-blue on the sides; second segment magenta in front, merging into purplish golden behind, with a reniform velvety black transverse patch in the middle, not reaching to the sides; lateral margin of the segment blue; third segment a mixture of magenta and bronze, with a quadrate velvety spot on each side in the middle; fourth segment somewhat darker, golden bronze in front, greenish in the midde, magenta on the posterior angles, with a quadrate velvety spot on each side in the middle, more widely separated one from the other than the previous pair; fifth segment prune-purple, bluish on the anterior angles: the sides of the abdomen are fringed with short pale hairs, the posterior angles of the fifth segment with black hairs, which project backwards. *Legs* yellow; posterior tibiæ brownish on the inner side; the last four joints of the tarsi brownish. *Wings* hyaline, with a conspicuous brown blotch at the tip, above the third vein; subcostal cell pale yellowish brown; third longitudinal vein straight: *alulæ* rudimentary.

Cinchona, Jamaica; June: one specimen, collected and presented by W. Fawcett, Esq.

This species is allied to *Ocyptamus* (*Baccha*) *cæruleus*, Will.

(Biol. Centr.-Amer., Diptera, iii. 38), from Mexico, and *Oeyptamus* (*Pipiza*) *costalis*, Walker (Linn. Trans. xvii. 342, 31) from S. America; it is, however, distinguished from both by its yellow face and legs, and by the colour of its abdomen, as also by its abdomen not being clothed with white, short, curved hairs, by the wings being without a brown fore-border, by the third longitudinal vein being straight, and by its smaller size.

Pipiza costalis, Walker, Linn. Trans. xvii. 342, from S. America, is an *Oeyptamus*, allied to *O. cæruleus* (*Baccha cærulea*), Will., Biol. Centr.-Amer., Diptera, vol. iii. p. 38.

Pipiza pica, Wlk., Tr. Ent. Soc. n. ser. iv. 156, from the Valley of the Amazon, = *Oeyptamus* (*Syrphus*) *trigonus*, Wied.

Pipiza dolosa, Wlk., *loc. cit.*, from the Valley of the Amazon, = *Oeyptamus dimidiatus*, F. (♂).

Pipiza divisa, Wlk., *loc. cit.*, from Vera Cruz, = *Oeyptamus dimidiatus*, F. (♀).

Syrphus stolo, Wlk., Dipt. Saunders. 241, from Brazil, is an *Oeyptamus*. The type is headless. The wings are apparently precisely similar to those of the ♂ of *O. dimidiatus*, F.; but the specimen is distinguished from this species by the yellowish markings on the sides of the abdominal segments, as well as by the yellower colour of the first two pairs of legs.

Syrphus antiphates, Wlk., List Dipt. iii. 589, is an *Oeyptamus*.

Syrphus peas, Wlk., *loc. cit.* 590, from —— ? = *Oeyptamus fuscipennis*, Say.—The head of Walker's type, as described by him, has been stuck on, and does not belong to it.

Syrphus amissas, Wlk., List Dipt. iii. 589, from Georgia, = *Oeyptamus fuscipennis*, Say. *Syrphus radaca*, Wlk., List Dipt. iii. 590, from Florida, = *Oeyptamus fuscipennis*, Say, var. *fascipennis*, Macq. Walker's description is drawn from two ♀ specimens, and not from a ♂, as stated by him.

The synonymy of the two last-mentioned species has already been recognized by Williston, Synopsis, &c., p. 119.

Syrphus iridipennis, Wlk. Linn. Trans. xvii. 345, from S. America, is an *Oeyptamus*, closely allied to *Oeyptamus funebris*, Macq. It may, indeed, be only a variety of the latter species, though the semi-hyaline space beneath the apex of the wing in the latter is much more indistinct in Walker's species, in which, again, there is a semi-hyaline streak in the middle of the submarginal, first posterior, and discal cells. The wings of Walker's type are, moreover, slightly narrower than those of specimens of *O. funebris*, Macq., in the collection.

Syrphus tarsalis, Wlk., Linn. Trans. xvii. 345, from S. America, is an *Oeyptamus*. There is a narrow pale yellow stripe on each side of the third abdominal segment, starting from the anterior angle and extending a little more than half the length of the segment, and a mark of the same colour shaped like an isosceles triangle on each side of the fourth segment, extending from the anterior angle not quite to the middle of the segment. The

apical fourth of the first joint of the posterior tarsi is yellowish white like the remaining joints of this pair of tarsi.

Baccha, F.

The genus *Baccha* seems to me at present to include at least three distinct groups of species. Of Group I. the European *B. elongata*, F., may be taken as a type; the members of this group, which are found in both the Old and New Worlds, are species with pedunculate abdomens, more or less dark in colour, usually varied with yellow markings, and hyaline or infuscated wings: the alulæ may or may not be rudimentary.

Group II. is composed exclusively of Neotropical forms, in which the abdomen is of a more or less ferruginous or ochraceous colour, marked with a series of continuous longitudinal stripes of a lighter tint, spatulate posteriorly and more or less contracted at the base; the dorsum of the thorax is usually covered with ochraceous pollen, and marked with stripes; the front bears a pronounced antenniferous projection, marked with a round black dot; the wings generally have an ochraceous infuscation, and the alulæ are of the full size: of this group *B. livida*, Schin., may be taken as typical; *B. conjuncta*, Wied., is an aberrant form.

Group III. at present also consists entirely of Neotropical species, the characteristics of which are a broad, flat abdomen, which is not contracted basally, but expands regularly to the end of the fourth segment, and is of a more or less ferruginous or yellowish colour, which is divided up by brown bands, &c., into broad and generally notched markings; infuscated wings, with the third longitudinal vein straight, or somewhat concave posteriorly, and rudimentary alulæ; there is also a small antenniferous process, marked with a round black dot: the shape and colour of the abdomen are thus the most striking features of this group, of which the species described below as *Baccha crocata* may be taken as a type. The only previously described species which I can assign to this group is *B. luctuosa*, Bigot (Ann. Soc. Ent. Fr. 1883, p. 334), from Mexico.

Of the species here described, all those from the Oriental and Australian Regions, as well as *B. signifera*, *levissima*, *incompta*, and *pumila*, from Brazil, and *B. sagittifera*, from Jamaica, belong to Group I. *B. amphithoe*, Wlk., from the Oriental Region, and *B. bigoti* (nom. nov.), from Brazil, also belong here.

Of Group II. the only species here described is *B. silacea*, from Brazil. Specimens of several other species, which are doubtless new and certainly belong to this group, are in the Collection, but are not in a sufficiently good condition to describe.

To Group III. belong *B. cultrata*, *flavens*, *gilva*, *crocata*, and *crocea*. *B. fervida* also belongs here, but has full-sized alulæ.

I think there is no doubt that the genus *Baccha* as it now exists ought to be split up; and, while I do not venture to undertake the task myself at present, I have endeavoured to indicate a way in which perhaps it might be done. It seems inconsistent to place

species like *B. rubricosa*, Wied., and *B. conjuncta*, Wied., in the same genus as *B. elongata*, Fab., when, for instance, what Fallén called *Scæva hyalinata* is distinguished generically from *Syrphus ribesii*, Linn., or when *Ocyptamus*, Macq., is allowed to retain its independence.

Group I.

BACCHA NUBILIPENNIS, n. sp. (Plate IV. figs 7, 9, ♂ ♀, and Plate V. fig. 14, head of ♂.)

♂ ♀. Length: ♂ 12½ to 14½ mm., ♀ 12⅔ to 13⅔ mm.

Face and *cheeks* yellow, with yellow pollen and pale yellow pile. Cheeks in ♂ sometimes narrowly blackish immediately below the eyes. A prominent, rounded, and sharply-defined facial tubercle, commencing halfway down the face; sometimes an indistinct brown stripe between it and the antennæ. *Antennæ* orange; third joint large, ovate, larger in the ♀ than in the ♂. A very pronounced antenniferous process, shining black above, and orange-yellow immediately above the base of the antennæ; the orange-yellow area is larger in the ♀; the projection is truncate and flattened in front, and pilose on the sides only. Front in ♂ greenish black, with yellow pollen, and vertical triangle black; in ♀ shining black, with a narrow triangular area on each side in front yellow pollinose. Pile on front blackish in ♂, yellowish in ♀, shorter in the latter than in the former. Occiput with a fringe of pale yellow hairs. *Thorax* shining black; the collar of hair in front pale yellow; elsewhere nearly bare. Humeri and postalar callosities brownish; *pleuræ* with a broad vertical stripe of golden pollen in front of the suture; the stripe has a reddish ground; pleuræ behind the wings silvery pollinose. *Scutellum* polished dark brown on the disc, more or less yellowish, semi-translucent, behind. General colour of the *abdomen* metallic black (browner in ♀), sometimes with a distinct bluish sheen; the abdomen is broadest in the fourth segment. The first segment has outstanding pale yellow hairs on each side; elsewhere the abdomen is clothed with very short appressed black pile. First segment black, browner and with an edging of yellow in the ♀; second segment with a yellow basal band, notched in the median line behind, and with an interrupted brownish-yellow band near the tip, the latter often scarcely visible in the ♂; *third segment with a conspicuous transverse yellow band*, occupying about the middle third of the segment, but slightly nearer the base; the remaining segments wholly metallic black; male genitalia small and concealed. *Legs* orange-yellow; posterior femora slightly darker, dark brown above and below on the distal half, but orange at the tips; posterior tibiæ reddish on basal third, then dark brown; posterior tarsi dark brown on basal two-thirds of first joint, then whitish yellow. *Wings* infuscated, dark brown in the middle, and usually darker in the ♂ than in the ♀; in the ♀ the wings show a faint secondary infuscation at the tips, above the third vein; an area at the base on the

inner side nearly hyaline; third vein gently curved above the base of the first posterior cell; in the ♂ the wings are narrower and less rounded at the tips, while the terminal section of the fourth posterior vein, closing the first posterior cell, is less sinuate and more oblique than in the ♀ : *alulæ* long, narrow, posterior margin straight.

Ceylon (*Lieut.-Colonel Yerbury*). The typical specimens are from Kandy (*circa* 1800 ft.), the ♂ collected June 28, 1892, the ♀ May 25, 1892. Common in the Central Province; one specimen from Baddegama, in the neighbourhood of Galle.

This species is distinguished from any other known to me from the Oriental Region, by the marking of the abdomen, and the sharply-defined facial and antenniferous tubercles when viewed in profile.

Baccha bicolor, sp. n. (Plate IV. fig. 6, ♂.)

♂. Length 13 mm.

Face and *cheeks* pale yellow, clothed with yellow pollen; a small, round, bare, sharply-defined tubercle slightly below the middle of the face. *Antennæ* yellow. Front brownish, yellowish pollinose on the sides, clothed with pale yellow pile. Vertical triangle black. *Thorax* dull brown, faintly pollinose on the dorsum; shoulders and pleuræ in front pale yellow; a conspicuous vertical stripe on the pleuræ below the transverse suture yellowish white, pollinose; a similar, but somewhat duller, spot behind and below the base of the wings. *Scutellum* reddish brown. *Abdomen*: first segment yellow, blackish on the sides; second segment yellow, brownish in the middle, and brown on the distal fifth; third segment yellow for rather more than half its length, then metallic brownish black, with a somewhat V-shaped transverse brown mark on the yellow portion near the base of the segment, the apex of the V being directed forwards and the arms widely divergent; the remainder of the abdomen metallic prune-purple; external genitalia yellow, not projecting beyond the fifth segment. The abdomen is spatulate from the commencement of the third segment, and on the dark portion is clothed with sparse and very short appressed black pile; elsewhere the body of this species is practically bare. The *first two pairs of legs* yellow; the posterior legs, except rather more than the basal half of the femora, which is yellow, pale brown; on the posterior femora a narrow band at the commencement of the dark portion is darker brown than the remainder, and the posterior tibiæ have the tips and an ill-defined band in the middle yellowish. *Wings* brown, paler at the tips, and with a small area at the base on the inner side nearly hyaline; the wings are rounded at the tip and show no angle at the junction of the costal vein with the hind margin; the second longitudinal vein bends downwards before joining the costa, so that the end of the marginal cell is blunt, while the third longitudinal vein bends slightly upwards at its termination, and the terminal portion of the fourth longitudinal vein is very oblique,

so that the outer extremity of the first posterior cell is wide: *alulæ* rudimentary.

Mysol Is., Malay Archipelago (*Wallace*): one specimen.

The type of this species was described by Walker (Journ. Linn. Soc. vii. p. 212) as being possibly the male of his species *Baccha purpuricola*, the type of which is a female. The yellow face and variegated abdomen of the present species, however, render its identity with *B. purpuricola* absolutely impossible. This species is clearly allied to *Baccha moluccana*, Doleschall (Natuurk. Tijdschr. Ned. Ind. xiv. p. 412, tab. iii. fig. 2), from Amboina, the abdomen of which, as figured by Doleschall, is strikingly similar to that of the present species; the face of Doleschall's species is, however, black in the middle and yellow on the sides, and he expressly states that the scutellum is black.

Baccha refulgens, sp. n. (Plate IV. fig. 4, ♀.)

♀. Length 13 mm.

Front, *face*, and *cheeks* metallic dark purple, thinly clothed with pale pile; facial tubercle not sharply defined. *Antennæ* orange-yellow; third joint oval. *Thorax* and *scutellum* metallic purplish violet, nearly bare; postalar callosities brownish. The *abdomen* spatulate from the commencement of the third segment, thinly clothed with short blackish pile; the first two segments metallic blackish, the remainder brilliant metallic pansy-purple. *Legs* yellow; posterior femora with a faint indication of a narrow brownish ring beyond the middle; distal third of posterior tibiæ and posterior tarsi brown. *Wings* hyaline, with the costal border to the tip of the third vein (including the costal, subcostal, and marginal cells) and a central area, which includes the basal cells, rather less than the basal half of the submarginal cell, rather less than the basal third of the first posterior cell and the basal two-thirds of the discal cell, and faintly extends to the posterior margin at the tip of the anal cell, brown: *alulæ* of full size.

Bouru Is., Malay Archipelago (*Wallace*): one specimen.

This species is allied to *Baccha purpuricola*, Walker (Journ. Linn. Soc. iii. [iv.] p. 129), from Key Is., but is distinguished at once by the colour of its thorax.

Baccha triangulifera, sp. n. (Plate IV. fig. 5, ♂.)

♂ ♀. Length 13 mm. (♀ 12½ mm.).

Front, *face*, and *cheeks* yellow, with short pale yellow pile; a narrow dark brown median stripe extending a little more than halfway down the face from the antennæ. Vertical triangle in ♂ shining black, very long and narrow, extending more than one-third of the distance between the occiput and antennæ. Front of ♀ with a brownish triangular spot immediately above the antennæ; very narrow above, metallic black, with parallel sides for one half its length from the occiput. Occiput dull black, pollinose, with a fringe of glistening whitish hairs. *Antennæ* orange, third joint

bluntly oval; arista brown, except the base. *Thorax* metallic black, finely punctate, with very short, silky, yellowish pile; humeri, a stripe from them to the suture, a vertical stripe on the pleuræ in front of the suture, a large rounded spot below this stripe, an oblique elongated spot behind the base of the wings, and the *anterior margin of the scutellum* pale yellow. *Scutellum*, except anterior margin, blackish brown, punctate. *Abdomen* cylindrical and very narrow from posterior half of first segment to middle of third, expanding and spatulate from thence to the tip; general colour reddish brown, clothed with short, appressed, blackish pile; second segment with fine, whitish, erect pile on the sides; *a very conspicuous translucent yellow spot*, occupying distal third (rather more in ♀) of the *third segment*, and *shaped like an equilateral triangle*; first segment yellow, brown at the tip; second segment reddish brown, darker at the tip, before which is a narrow indistinct lighter band; base of third segment yellowish, posterior margin brown; fourth segment polished dark brown, steely on posterior margin in ♂; fifth segment polished dark brown, with a steely sheen; external genitals reddish in both sexes, rather prominent in ♂. *Legs* luteous, coxæ blackish brown; posterior femora reddish brown, yellowish at the base; posterior tibiæ pale yellow on basal third, then dark brown; first joint of posterior tarsi dark brown, except at the tip; this and the remaining joints dull yellow. *Wings* hyaline, with a brownish tinge along the posterior margin; subcostal cell dark brown, and a brownish patch at the distal extremity of the marginal and submarginal cells, terminating sharply at the third vein; the latter straight; veins dark brown: *alulæ* almost absent.

In the shape of the profile of the face and in the venation of the wing, this species resembles *B. pedicellata*, Dol. (according to Doleschall's figure), from Java; but the sharply-defined yellow triangle on the third abdominal segment distinguishes the species from any other known to me.

Huldamulla, Ceylon; *circa* 4000 ft. (*Lieut.-Colonel Yerbury*). A pair taken *in copulâ*, June 10, 1892.

BACCHA PULCHRIFRONS, sp. n. (Plate IV. figs. 10, 10ª, 11, ♂ ♀.)

♂ ♀. Length: ♂ 10 to 11½ mm., ♀ 9¾ to 10¾ mm.

In ♂, *front*, upper part of the *face* immediately below the antennæ, and a *broad facial stripe* reaching to the oral margin steely. In ♀, *front*, including whole circumference of antenniferous projection and a *facial stripe*, narrower than in the ♂, but reaching to the oral margin, metallic black, sometimes steely; sides of *face* yellowish pollinose; cheeks orange-yellow, with a blackish-brown spot in front, more or less distinctly connected with the facial stripe, sometimes indistinct in the ♀. *Front* (including vertical triangle in the ♂) and *face* clothed with pale yellow pile. Frontal triangle in ♂ dusted with yellowish pollen above; front in ♀, a little below the middle, with a triangular patch of pale yellow pollen on each side, the apices of the triangles meeting or narrowly

separated in the median line. A distinct facial tubercle and antenniferous process, the latter somewhat more pronounced in the ♀ than in the ♂. *A lunate spot on each side of the antenniferous process metallic violet. Antennæ* orange-yellow; third joint oval; arista brown, yellow at the base. Occiput black, whitish pollinose, with a fringe of pale hairs. *Thorax* and *scutellum*: in ♂ metallic bronze-black, clothed with golden pile; in ♀ metallic blue-black, clothed with shorter whitish-yellow pile; in the ♂ a sometimes obscure yellowish vertical stripe on the pleuræ beneath the suture; in the ♀, humeri and a similar vertical stripe on the pleuræ light yellow, the stripe with whitish pile. General colour of the *abdomen* bronze-black, with yellow markings; clothed with erect and rather long yellowish pile on the sides of the first three segments, and elsewhere with appressed pile, black on the black and whitish on the yellow portions: the sides of the third and fourth segments in the ♂ are so curled round ventrally as to make the abdomen at the tip appear not more than double the width of the second segment at the base; distal half of the abdomen of the ♀ spatulate; first segment reddish yellow, brown on the hind margin, sometimes wholly brown or bronze-black in the ♂; second segment bronze in the ♂, sometimes reddish on each side at the base, with a more or less distinct reddish-yellow transverse band on the second sixth from the hind margin; in some specimens the second segment is wholly bronze-black in the ♂, except the posterior fifth, which is dull black; second segment in the ♀ metallic black, with a reddish-yellow band on the second fifth from the hind margin, and sometimes reddish yellow at the base; third segment in the ♂ bronze on the basal and dull black on the apical third, with a quadrate yellow spot on each side in the middle; third segment in the ♀ metallic black, with a yellow, somewhat triangular spot on each side in the middle, the apices directed outwards, and the bases inclined one towards another and sometimes narrowly meeting in the middle line in front; the posterior side of each triangle concave; fourth segment in the ♂ bronze-black, with a quadrate yellow spot on each side at the base, occasionally somewhat obscure, but when distinct deeply emarginate posteriorly, so that each spot shows a sharp angle projecting backwards on each side of the median line; fourth segment in the ♀ metallic black, with a yellow longitudinal stripe on each side of the median line, starting from the base and running the whole length of the segment, and a broader yellow elongated spot starting from the base of the yellow stripe on each side and running obliquely outwards, so as almost to cut off a basal angle; in some specimens the yellow longitudinal stripes become obsolete before reaching the hind margin of the segment, and in others apparently do not run more than halfway; fifth segment in the ♂ wholly metallic black; genitalia small, metallic black; fifth segment in the ♀ metallic black, with a somewhat confused repetition in miniature of the yellow markings on the fourth segment. *Legs* yellow; coxæ blackish brown, and a band on the outer half of the posterior

femora, not reaching to the tips, and the distal third of the posterior tibiæ brown; there is sometimes an indication of an incomplete brownish ring round the middle of the posterior tibiæ. *Wings* in the ♂ sharper at the tip, and with the terminal portion of the fourth longitudinal vein, closing first posterior cell, more oblique than in the ♀; suffused with brown, usually lighter at the base on the inner side, darker in the costal and subcostal cells and in the middle, and with the stigma and an elongated and not sharply-defined spot at the tip, above the third vein, dark brown; wings in the ♀ hyaline, the subcostal cell brown, and the stigma and an elongated spot at the tip above the third vein, as in the ♂, dark brown; third longitudinal vein gently curved: *alulæ* of full size.

Ceylon (*Lieut.-Colonel Yerbury*): twelve specimens. The types are from the Hot Wells at Trincomali, the ♂ collected on Nov. 2, 1890, and the ♀ on March 13, 1892; very common on the Trincomali side. Other specimens from Kandy (whence also the Museum collection contains two collected by Mr. E. E. Green), Heneratagoda, and Bentota. Apparently the commonest species of *Baccha* in Ceylon.

This species is very closely allied to *Baccha apicalis*, Lw. (Wien. ent. Monatschr. Bd. 2, p. 106), from Japan, and may, indeed, be identical with it. Since, however, Loew describes a ♀ only, of which the head was destroyed, and considering the great difference in the locality of the specimens, it is impossible to be certain of the identity without comparing Loew's type, and I have therefore ventured to consider the present specimens as distinct. In the markings of the third and fourth segments of the abdomen, *B. pulchrifrons* resembles *B. dispar*, Walker (Journ. Linn. Soc. iii. [iv.] p. 121), from Macassar, Celebes. The latter species, however, is at once distinguished by its much greater size and by the brown band across the centre of the wing.

Besides the specimens mentioned above, Colonel Yerbury obtained two others, which he bred from an Aphis-infested leaf of the "Cambuk" tree, found at Nilavelli on Nov. 16, 1890. The flies, which are ♂ and ♀, emerged on Nov. 29 and 30, 1890. The specimens are somewhat smaller than the majority of those of *B. pulchrifrons* (the ♀ measures 9¾ mm. in length; the head of the ♂ is unfortunately missing), but resemble them in their general habitus, with the following differences:—the thorax of the ♂ is more greenish black and less bronze; the yellow markings of the abdomen in both sexes are much more distinct, sharper, and more opaque-looking; those on the third and fourth segments of the abdomen of the ♂ are larger than in *B. pulchrifrons*, and the inner longitudinal stripes on the fourth segment in the ♀ are broader, and expanded on the hind margin of the segment; the *wings*, with the exception of the subcostal cell, which is brown, are *hyaline in both sexes*, with a very faint infuscation at the tip above the third vein; there is an indication of the metallic violet spot on each side of the base of the antenniferous process in the ♀. As these specimens are not in a good state of preservation, it is impossible

to decide whether they really belong to a new species; I therefore regard them provisionally as a variety of *B. pulchrifrons*.

BACCHA FALLAX, sp. n. (Plate IV. fig. 12, ♂.)

♂. Length 11 mm.; wing, length 8¾ mm, width across the centre 2¾ mm. Very closely resembling *B. pulchrifrons*; differing as follows:—*front*, and broad median *facial stripe* reaching to the oral margin, metallic black, not steely; sides of the *face*, including upper portion, and *cheeks* deep yellow; antenniferous process considerably smaller, when viewed from above, and no trace of metallic violet spot on the side; *thorax* and *scutellum* more bronzed; *pleural stripe orange, much more conspicuous*, and rising higher on the sides of the dorsum; first segment of the *abdomen* pure yellow; second segment considerably narrower, longer, and wholly bronze-black, except the basal angles, which are yellow; *the yellow markings on the third and fourth segments entirely resembling those on the corresponding segments in the ♀ of B. pulchrifrons, and not as in the ♂ of that species*; wings longer and narrower; except at the base, uniformly suffused with brown, not darker in the middle; apical spot above the third vein reduced to a mere line, so as to appear as a simple continuation of the stigma: *alulæ* long and rather narrow, with a straight posterior edge.

Ceylon (*Lieut.-Colonel Yerbury*): two specimens, both males. The type was collected at Haycock Hill, near Galle, April 27, 1892; the second individual at Kandy, May 30, 1892.

Owing to the deceptive similarity between the markings on the abdomen of this species and those on the abdomen of *B. pulchrifrons* ♀, these specimens would certainly be regarded as males of the latter if regard were not paid to the differences enumerated above.

BACCHA AMPHITHOE, Walker, List. Dipt. iii. 549. (Plate IV. fig. 2, ♀.)

Walker's type is from the "East Indies," *i. e.* Mulmein, according to the Museum register, coll. Archdeacon Clerk. The Museum collection also contains another specimen from Sarawak, collected by Wallace (Walker, Journ. Linn. Soc. i. 125). Walker's type, however, is a mere fragment, the sex of which it is impossible to determine, and was minus its head when Walker described it. I therefore avail myself of the opportunity presented by the acquisition of three specimens from Ceylon, contained in a collection of Diptera recently brought home by Lieut.-Colonel Yerbury, to re-describe this species. The specimens from which this re-description is drawn will be marked and placed in the Museum collection.

♂ ♀. Length: ♂ 10 mm., ♀ 10 to 11 mm. *Face* and *cheeks* yellow. A sharply-defined black median stripe on the face, from antennæ to mouth, becoming somewhat indistinct before reaching the mouth in the ♀; sometimes with a metallic bluish sheen. A low facial tubercle. Front metallic black in both sexes, and yellow

on each side below; yellowish pollinose above in ♂, and with a triangular patch of yellow pollen on each side in the middle in the ♀, scarcely separated by an indistinct black median line. *Antennæ* orange-yellow; third joint oval. Front and face in both sexes clothed with very short pale yellow pile. Occiput yellowish pollinose, with a fringe of silvery yellow hair. *Thorax* metallic black, clothed on dorsum with very short appressed golden pile. Humeri, an elongated spot from thence to the suture, a vertical stripe and rounded spot below the sutural end of this, and two oblique elongated spots below the base of the wing, and separated by a fine line, yellow. Post-alar callosities reddish brown, sometimes darker. *Scutellum* wholly yellow, but sometimes semi-translucent behind, or more or less distinctly brownish on the disc. *Abdomen* cylindrical at the base, expanding rapidly and spatulate (especially in the ♀) from the base of the third segment: general colour reddish yellow, polished, with very short pile; *third and fourth segments with conspicuous black hind margins*; first segment reddish yellow, with erect pale yellow pile on each side; second segment cylindrical, reddish brown, darker at the distal end, with a yellowish band occupying the second fifth of its length from the hind margin; third segment yellowish at the immediate base, with a reddish-brown triangular patch on each side (especially distinct in the ♀) narrowly reaching the hind margin, then yellow, except the hind margin, which has a sharply defined black band; the yellow area of the segment is consequently triangular, with its apex directed forwards; fourth segment yellow, the basal angles, sides, and a large somewhat triangular area on the hind margin with its apex directed forwards, black (the sides of this and the previous segment in the ♂ are usually curled round ventrally, and to be seen must be looked at from beneath); fifth segment yellow, with a blackish median basal spot, indistinct in the ♂: ♂ genitalia reddish yellow, projecting. *Legs* yellow; coxæ blackish at the base; an ill-defined band on the distal half of the posterior femora, not reaching to the tip; distal half of the posterior tibiæ, and base of first joint of the posterior tarsi, brown. *Wings* suffused with brownish; costal border to the termination of the third vein brown, darkest in the outer portion of the subcostal cell and at the tip: *alulæ* of about half the normal size.

Ceylon, neighbourhood of Trincomali (*Lieut.-Colonel Yerbury*); Mulmein (type); Sarawak (*Wallace*). Colonel Yerbury obtained five specimens, three of which he has presented to the Museum. He states that the species is rare. The ♂ which I have described was taken at Kanthalai, March 8, 1892; the ♀ at Kottawa, April 24, 1892: the third specimen presented is a ♂, also from Kanthalai, Jan. 31, 1891; the other two individuals obtained are a ♂ and ♀, the former from Bentota, June 6, 1890, and the latter from Huldamulla, June 10, 1892.

Baccha gratiosa, Big., from Sarawak, and *B. vespæformis*, Dol. (Natuurk. Tijdschr. Ned. Ind. xiv. p. 411, pl. iii. fig. 1), from Amboina, are allied to this species. The latter resembles it very

closely, and may be identical, but Doleschall does not mention the black stripe on the face, while he states that the abdomen of his species has *three* transverse black bands.

BACCHA SULICA, sp. n. (Plate IV. fig. 3, ♀.)

♀. Length 9 mm.

Face and *cheeks* pale yellow pollinose, with a small but sharply-defined facial tubercle. Front metallic blue, with a pollinose stripe on each side on the lower two-thirds. *Antennæ* yellow; first two joints very small, third joint ovate, large. *Thorax* dark brown on the disc and below the base of the wings; pale yellow on the sides in front, and with a pale yellow pollinose vertical stripe on the pleuræ below the suture, and a similar spot behind the base of the wings. *Scutellum* yellow. *Abdomen* spatulate, but not excessively attenuate at the base: first segment yellow; second segment yellow, brown on the distal fifth and indistinctly brownish in the middle; third segment yellow for rather more than half its length, then metallic purplish dark brown, a transverse brown band on the yellow portion; the remainder of the abdomen metallic purplish dark brown. With the exception of a few outstanding pale yellow hairs on each side of the first abdominal segment, the body of this species is nearly bare. *Legs* pale yellow, the posterior tibiæ and tarsi brownish, and a narrow brown band on the distal half of the posterior femora, not reaching to the tips. *Wings* with a brownish tinge; the subcostal cell, from the junction of the auxiliary vein with the costa, pale brown: the wings are blunt at the tips: *alulæ* rudimentary.

Sula Is., Malay Archipelago (*Wallace*): one specimen; a second specimen is from Mysol (*Wallace*).

In the markings of the abdomen this species somewhat resembles *Baccha moluccana*, Doleschall (Natuurk. Tijdschr. Ned. Ind. xiv. p. 412, pl. iii. fig. 2), from Amboina, which, however, is at once distinguished by its black scutellum, as well as by its greater size.

I found the type of this species labelled "*sulica*" in Walker's handwriting, but I cannot discover that it has ever been described.

BACCHA SAGITTIFERA, sp. n. (Plate IV. fig. 14, ♀.)

♀. Length 8½ mm.

Purplish black, nearly bare, pleuræ and abdominal markings yellow; those on the fourth abdominal segment sagittate. Abdomen spatulate posteriorly, cylindrical, but stout, to end of third segment. Wings suffused with brown at the tips; alulæ apparently wanting.

Face and *cheeks* pale opalescent yellow; oral margin brighter yellow; a well-marked facial tubercle, below which the face recedes. Front yellow, with a black median stripe extending from the vertex to the base of the low antenniferous projection; the latter brassy, with a shining black dot in the median line immediately above the antennæ; antennæ orange, very small, short, third joint oval, darker above. Post-alar callosities pale yellow, pleuræ brassy

yellow, pectus and metanotum metallic black. *Scutellum* brownish yellow. *Abdomen*: the anterior margin and sides of the first segment pale yellow; on the second segment a narrow transverse band, slightly notched in the median line behind and situated just beyond the middle of the segment; third segment with a crescentic band in the middle, narrowly interrupted in the median line, concave posteriorly, and nearly three times as broad as the band on the second segment; the sagittate markings are situate on the anterior half of the fourth segment, and directed anteriorly, they are narrowly separated in the median line and are truncated in front by the hind margin of the preceding segment; on the fifth segment the yellow markings consist of deeply notched bases of arrow-heads, situated one on each side of the anterior half of the segment, the whole of the remainder of the arrow-heads being, as it were, hidden beneath the fourth segment; the inner angles of the bases of the arrow-heads are longer than the outer, and the notches are very much larger than in the case of the arrow-heads on the previous segment; sixth segment wholly purplish black: the markings on the fourth and fifth segments are of a deeper yellow than the others. *Legs* yellow; the posterior femora and tibiæ each with two brown bands, the band near the base of the femur being more diffuse and less distinct than the others; similar bands are faintly indicated on the middle legs. *Wings* with a brownish tinge, which becomes concentrated at the tips; distal half of subcostal cell brown; third longitudinal vein straight; distal portion of fourth vein, closing first posterior cell, short, upright.

Cinchona, Jamaica; June (*W. Fawcett, Esq.*): one specimen.

This species of *Baccha* is distinguished from any other known to me, by the shape of the conspicuous yellow markings of the abdomen.

BACCHA SIGNIFERA, sp. n. (Plate IV. fig. 8, ♂.)

♂. Length 11½ mm.

Face and *cheeks* metallic blue-black, with black pile; face narrowly shimmering white on the sides above; facial tubercle sharply defined, conical; *front* (including the large antenniferous projection) metallic black, with a dull black quadrate median area behind. The first two joints of the *antennæ* black; the third brown; the arista brown. *Thorax* dull velvety black on the dorsum, with three stripes on each side of the median line metallic black; the innermost stripe on each side is very narrow and tapering, and does not reach much more than halfway; the intermediate stripe is broader, and also tapers, but fuses posteriorly with the lateral stripe, which is very broad indeed, and extends to the scutellum; the two outside stripes are divided by the transverse suture; the lateral stripe includes the post-alar callosity; *pleuræ* metallic bronze-black. *Scutellum* metallic black; thorax and scutellum clothed with short black pile. *Abdomen* dull velvety black, *with yellow dots* and metallic bands;

first segment steely, with a tuft of black hairs projecting from the anterior angles, behind which is a tuft of yellow hairs; second segment steely on the anterior third above, on the sides for more than halfway, and on the hind margin, the remainder of the segment dull black, with a yellow dot on each side; third segment steely on the lateral margins, and with a narrow transverse steely band in front and behind, elsewhere dull black, with four oval yellow dots arranged in the form of a quadrilateral, the anterior pair twice as far apart as the posterior; fourth and fifth segments steely on the lateral and posterior margins, elsewhere dull black, and each with four oval yellow dots arranged as on the third segment; genitalia small, concealed: the abdomen is broadly spatulate, expanding from the base of the third segment to the posterior margin of the fourth, and contracting thence to the tip; the second segment is stout and cylindrical, with a fringe of hairs on each side, yellow in front and black behind; the remainder of the abdomen is sparsely clothed with short appressed black pile. *Legs* black, with short, close-fitting black pile: the tarsi flattened. *Wings* suffused with brown, with a darker area at the base, which is paler towards the posterior margin, and extends a little beyond the anterior cross-vein on the costal side: *alulæ* well-developed.

Ega, Brazil (*Bates*): one specimen.

This species is allied to *Baccha adspersa*, Fab., but is at once distinguished by the infuscation of the entire wing. The terminal section of the fourth vein is also much more oblique in this species than in *B. adspersa*.

BACCHA LEVISSIMA, sp. n. (Plate IV. fig. 15, ♂.)

♂. Length 10½ to 11½ mm.; length of wing 6½ to 7 mm.

Metallic bronze-black, with dead-black markings on the abdomen; the latter greatly attenuated: wings very short, infuscated; alulæ rudimentary.

Face and *cheeks* metallic steely black, clothed (except on the tubercle) with cinereous pollen; facial tubercle prominent. *Front* with a pentagonal dead-black patch in the angle of the eyes, on each side of which, when viewed from behind, is a shimmering white dot; front elsewhere and antenniferous process metallic black, the latter with a flattened rugose area above. Vertical triangle black; the short pile on the front and vertical triangle black. *Antennæ* small; the first two joints black, the third brown, oval; arista blackish brown. Occiput black, with silvery pollen, and fringed with short whitish hairs. *Thorax* rather dull, metallic bronze-black on the dorsum, shining metallic greenish black on the pleuræ; a narrow dead-black median stripe on the anterior part of the dorsum, not extending beyond the region of the transverse suture: on either side of this stripe the dorsum in front is brownish pollinose, when viewed from behind or from the side. *Scutellum* metallic black; scutellum and dorsum finely punctate, almost bare. *Abdomen*: first segment metallic steely; second segment steely, with a broad dead-black transverse band,

concave posteriorly, on the hinder half of the segment, widely separated, however, from the posterior margin; in front of the black band is a small elongate and somewhat oblique yellow mark on each side, between which a narrow median dead-black stripe runs forwards from the cross-band, and bifurcates anteriorly; third segment similar to the second, except that the lateral yellow dots are more quadrate and less oblique, and that the median dead-black stripe does not bifurcate in front, but has a club-shaped head, which touches or is narrowly separated from the anterior margin of the segment; the fourth segment is shorter and broader than the third, but is similar to it, except that the yellow marks, which are duller and not so sharply defined, and sometimes indistinct, are considerably larger and elongated longitudinally; fifth segment wholly metallic black; genitalia metallic bluish black, small. The abdomen is sparsely clothed with very short black pile. *Legs*: anterior pair brown, darkest on the tarsi, which are flattened; the femora at the extreme base and at the tip, the tibiæ at the base and at the extreme tip, yellow; the femora are also yellowish in the middle on the inside; second and third pairs of legs blackish brown, the tips of the femora, bases of the tibiæ, and extreme tips of the middle tibiæ, yellow: the middle femora have a fringe of dark hairs, the posterior coxæ a fringe of pale yellow hairs beneath. *Wings* uniformly pale brown, except the subcostal cell, which is dark brown. Halteres orange.

Brazil, region of the Amazon (*Bates*): three males.

This species is allied to *Baccha brevipennis* and *B. rugosifrons* of Schiner (Reise 'Novara': Diptera, 341) and to *B. stenogaster*, Williston (Trans. Amer. Ent. Soc. xv. 266); it is, however, distinguished at once from the two first mentioned by the yellow spots on the abdomen and by the infuscated wings, as well as by its dark legs in the case of *rugosifrons*, and from *stenogaster* by its infuscated wings and dark legs.

BACCHA BIGOTI, nom. nov.

Syn. *Baccha apicalis*, Bigot (nec Loew). Bigot's species was described from Brazil (Ann. Soc. Ent. Fr. 6 sér., t. iii. p. 334, 1883); Loew's from Japan (Wien. ent. Monatschr. Bd. 2, p. 106, 1858).

The *alulæ* are about half the normal size, with a straight posterior edge.

BACCHA INCOMPTA, sp. n. (Plate IV. fig. 13, ♂.)

♂. Length 10 mm.

Metallic dark brown, nearly bare: wings hyaline, the costal and subcostal cells, a somewhat zigzag mark from the first to the fifth longitudinal veins, crossing the origin of the third vein and involving the cross-veins at the tip of the posterior basal cell, and a blotch at the tip of the submarginal cell, slightly overflowing into the marginal, brown; alulæ of the full size.

Face and *cheeks* metallic steely blue; the former without a

vestige of a tubercle, clothed with pale whitish pile, and cinereous pollinose on the sides. *Front* metallic blue at the sides, bronze-black in the middle, clothed with blackish pile; the apex of the angle of the eyes and a narrow margin on each side cinereous pollinose: antenniferous process not prominent. *Antennæ* yellow, small; third joint somewhat oblong in shape, rounded at the tip, which, with a rather broad upper margin, is brown. Occiput cinereous, fringed with silvery hairs. *Thorax* and *scutellum* metallic bronze-brown, the latter steely on the hind margin; pleuræ bronze anteriorly, pale metallic bluish white behind the base of the wings; post-alar callosities reddish: thorax sparsely clothed with very short dark pile, the scutellum with longer pale pile. *Abdomen* slender, spatulate, steely on first segment, elsewhere brown; the typical specimen has a narrow transverse faint yellow band, widely divided in the middle, at the base of the fourth segment; genitalia small, concealed: a tuft of whitish hairs on each side of the first segment, and the second and third segments with a fringe of shorter pale hairs on each side; the abdomen elsewhere nearly bare. *Anterior legs* yellow, the third and fourth joints of the tarsi, and the outer side of the femora towards the base, brownish; *second and third pairs of legs* brown, the bases and tips of the femora, the basal third of the posterior tibiæ, the whole of the middle tibiæ, the first two joints of the middle tarsi, the tip of the first and the whole of the second joint of the posterior tarsi, pale yellow: the middle femora with a fringe of rather long pale hairs behind; the posterior femora with a similar but shorter fringe of hair on the outer and inner side. Third longitudinal vein of the wing straight.

Brazil, region of the Amazon (*Bates*): two specimens, both males.

This species is not closely allied to any other known to me; in the markings of the wings it resembles *B. bigoti*, which, however, distinguishes itself at once by the reddish colour of the basal half of the abdomen, as also by the rudimentary condition of its alulæ.

BACCHA PUMILA, sp. n. (Plate V. fig. 12, ♂.)

♂ ♀. Length 6½ mm.

Yellow, shining: centre of dorsum of the thorax shining black, with three cinereous pollinose stripes; abdomen contracted, but yet stout, at the base, then spatulate; with dark brown cross-bands and lineate markings. Legs yellow; posterior femora in the ♂ with the basal third and a band near the tip, posterior tibiæ with a fainter band near the base, brown; these markings are much fainter in the ♀, and in another ♂ the extreme base of the posterior femora is yellow. Wings hyaline; subcostal cell brown: alulæ rudimentary.

Face and *cheeks* pale opalescent yellow, a narrow shimmering white border next the eyes, when the face is viewed from above; facial tubercle relatively large, at least in the ♂, rounded; in the ♂, frontal triangle and antenniferous projection pale shining yellow with a black dot above the base of the antennæ; vertical

triangle long, narrow, cinereous pollinose. *Front* in the ♀, except the posterior third, which is cinereous pollinose, pale shining yellow, with a blackish-brown dot in the centre line above the base of the antennæ, from which a narrow brown median stripe runs back to the pollinose portion: ocelli remote from the vertex in both sexes. *Antennæ* yellow, third joint rounded at the tip; arista black. Occiput cinereous pollinose. The median cinereous pollinose stripe on the thorax is much narrower, and also somewhat longer, than the lateral ones, but all the stripes terminate at a considerable distance from the scutellum: front portion of the pleuræ metallic yellow; pectus, posterior portion of the pleuræ, and metanotum steely black. *Scutellum* yellow; a narrow stripe along the anterior margin, tapering towards the sides, which it does not quite reach, black. First segment of the *abdomen* with a dark brown posterior border, the lateral protuberances with a tuft of yellow pile; second segment with the anterior and posterior thirds (in the typical ♂ rather more than the anterior third) dark brown, so that the yellow ground-colour is restricted to a band across the middle; this may appear to be narrowly divided in the median line; third and fourth segments with the hind margin, the median third of which is expanded (considerably so in the typical ♂), a quadrate area occupying each posterior angle, a somewhat clavate mark projecting inwards and forwards from these, and a median narrow stripe dark brown; in the typical ♀ the median stripe does not quite reach the anterior margin of the segment, while the "clavate" markings are narrower and less clavate than in the ♂: in a second ♂ in the collection the median stripe is much broader, and also does not quite reach the anterior margin; on the fifth segment the markings are precisely similar, except that the brown posterior margin and the quadrate areas in the posterior angles are almost obsolete, and that (in the typical specimens at least) the median stripe reaches the anterior margin of the segment in both sexes: sixth segment yellow. Third longitudinal vein of the wings somewhat sinuate, convex forwards above the distal half of the first posterior cell; terminal portion of fourth vein bounding the first posterior cell only slightly oblique; posterior cross-vein straight.

Brazil, region of the Amazons (*Bates*): three specimens.

This species is distinguished by its size and markings from any other known to me.

Group II.

BACCHA SILACEA, sp. n. (Plate V. fig. 13, ♂.)

♂. Length 10 mm.

Thorax dull, clothed with dense pollen of pale sienna colour, with narrow leaden stripes; a somewhat sharply defined median pyriform area on the pectus greenish bronze; abdomen flattened, but little contracted basally, rufous ochraceous, with orange-ochraceous stripes; front with an obtuse antenniferous projection, marked with a round black spot: alulæ of full size.

Facial tubercle and oral margin pale orange, the remainder of the *face* and *cheeks* pale yellow, opalescent. *Front* clothed with short dark pile, tawny pollinose, anterior face of antenniferous projection shining; a smaller and fainter black spot in the median line posteriorly, near the apex of the angle formed by the eyes; ocelligerous tubercle black, clothed with short and rather stout black hairs, which curve forwards. *Antennæ* orange, short, third joint blunt. Sides of the *thorax* orange, dull, but becoming brassy below; two of the narrow leaden stripes are approximated in the median line in front, and do not reach more than halfway; the other two stripes, which are slightly broader, are lateral in position, one on each side, and extend almost to the hinder margin; besides these there is a faint indication of a fifth stripe, median in position, starting from between the ends of the median stripes, and running to the hind margin of the dorsum; metanotum greenish bronze; post-alar callosities orange, shining: the dorsum of the thorax in front and the anterior portion of the pleuræ are thinly clothed with yellow pile, which becomes more orange near the base of the wings; the dorsum near the transverse suture with short brown pile. *Scutellum* ochraceous, with yellow pile below, and dark brown pile round the margin. First segment of the *abdomen* yellowish ochraceous, tumid and pale yellow at the sides; the remainder of the abdomen rufous ochraceous, with orange-ochraceous markings; on the second segment these markings consist of a narrow and ill-defined transverse band close to the hind margin, and of a crescent-shaped band on the posterior half of the segment, convex anteriorly, widely separated in the middle line, and tapering towards the posterior angles; the third and following segments are marked by five continuous longitudinal stripes, of which that in the median line is very narrow and not sharply defined, while the intermediate ones are much the broadest and most sharply defined; the stripes formed by the ground-colour on each side of the median line are slightly broader than the intermediate orange-ochraceous stripes, while those between the latter and the lateral stripes are much broader than any of the light-coloured stripes; on the fifth segment the stripes converge posteriorly. Genitalia small, concealed. *Legs* yellow, a band on the distal half of the posterior femora, not reaching to the tip, and the distal half of the posterior tibiæ pale brown. *Wings* uniformly suffused with pale sienna colour; the auxiliary and first longitudinal veins, and the bases of the following veins as far as the fifth, pale orange: third longitudinal vein rather abruptly convex forwards above the distal half of the first posterior cell.

Brazil, region of the Amazon (*Bates*): one specimen.

This species is apparently closely allied to *Baccha notata*, Lw. (Dipt. Amer. Septent., Cent. vii. 65), from Cuba, and belongs to the group of which *Baccha livida*, Schin. (Reise 'Novara,' 343), *Baccha* (*Syrphus*) *flavipennis*, Wied. (Auss. zw. Ins. ii. 123), and *Baccha lineata*, Macq. (Dipt. Exot. i. Suppl. 139, t. 20, fig. 5), are also members.

Group III.

BACCHA CULTRATA, sp. n. (Plate V. figs. 8, 9, ♂ ♀.)

♀. Length 12½ mm.; width of second abdominal segment 2½ mm., of fourth abdominal segment 3 mm., across the posterior margin in each case.

Head and thorax yellow, central portion of dorsum of thorax dark greenish bronze, with three cinereous pollinose stripes; abdomen very broad and flat, not contracted basally, but expanding regularly to beyond the middle of the fourth segment, chestnut coloured, with ochraceous bands and other markings, a posterior band on the second to the fourth segments shining burnt-sienna coloured; first and second pairs of legs wholly ochraceous; posterior pair ochraceous rufous, with an incomplete and ill-defined brownish band near the tips of the femora, the tibiæ, except the base and tips, dark brown, and the tarsi whitish yellow. Wings large, broad, strongly suffused with ochraceous, darkest along the fore-border above and immediately below the second longitudinal vein, and in the distal third of the submarginal cell; there is also a less dark area on each side of the sixth longitudinal vein; second longitudinal vein considerably convex forwards in the central portion of its course; third longitudinal vein nearly straight, terminal portion of fourth vein closing first posterior cell deeply sinuate, but not very oblique: alulæ about half the full size, with a straight posterior edge: knobs of halteres ferruginous.

Face and *cheeks* shining opalescent yellow; facial tubercle low, ochreous. *Front* orange-ochraceous, dull, the posterior fourth dark olivaceous; antenniferous tubercle shining yellow on the sides, with a large quadrate shining black spot above the base of the antennæ; from the ocelli, which are remote from the vertex, a narrow dark median stripe runs forwards, but becomes faint and nearly obliterated before reaching the supra-antennal spot. *Antennæ* missing: occiput yellowish pollinose, with a fringe of pale yellow hairs. Of the three cinereous pollinose stripes on the thorax, one, which is very narrow, is in the median line, and is separated by two narrow dark stripes from the other two cinereous stripes, which are broader; outside these is a very broad dark bronze stripe on each side, which is divided by the transverse suture; the cinereous stripes are abbreviated at about two-thirds the length of the thorax, leaving the bronze colour to extend to the scutellum; sides of the dorsum and pleuræ metallic yellow, the posterior portion of the pleuræ more steely; metanotum shining bronze. *Scutellum* raw-sienna coloured, yellower along the anterior margin, moderately shining. *Abdomen*: first segment yellow on the sides, orange-ochraceous in the centre, with the central portion of the posterior border dark brown; second segment reddish ochraceous at the base, and with a narrow and considerably curved (posteriorly concave) ochraceous band across the middle; this may appear to be narrowly interrupted in the median line; third segment narrowly ochreous at the extreme base, and with a broad, slightly curved (posteriorly concave) ochraceous transverse band,

tapering somewhat towards the sides and narrowly divided in the median line; in the median line the band is about three times as far from the posterior margin of the segment as from the anterior, and it may appear not quite to reach the lateral margins; on the fourth segment the ochraceous markings take the shape of a somewhat lunate mark projecting backwards from the anterior margin on each side of the median line, with a narrow piece projecting obliquely from the base of each mark towards the lateral margin on each side; the inner margin of the "lunate" marks is convex, they extend about two-thirds the length of the segment, and are obliquely truncated anteriorly and posteriorly; the extreme base of the segment is narrowly ochraceous from each "lunate" mark to the side; on the fifth segment the ochraceous marks are represented by a stripe on each side of the median line, starting from the anterior and reaching to the posterior margin, with the inner side of each slanting outwards posteriorly, so that the ground-colour between them constitutes a small triangle, which is continued as a narrow median stripe to the anterior margin; the ends of the two ochraceous stripes are connected by a narrow and indistinctly defined band near the posterior margin; in addition to this there is a small ochraceous triangle projecting from the anterior margin of the segment on each side, between the stripe and lateral margin, with its base connected with the stripe and its apex situated at rather more than one-third of the length of the segment; sixth segment with the median two-fourths of its hinder margin occupied by a yellowish band, each end of which is connected with the anterior margin by a short ochraceous stripe. The lateral prominences of the first abdominal segment bear a tuft of ochraceous pile, mingled with blackish pile posteriorly; the remaining segments are sparsely clothed with very short black pile, which becomes somewhat longer on the sides, especially in the case of the fifth segment.

Brazil, Santarem (*Bates*): one specimen.

There are also two males in the collection which I consider to belong to this species; but since they are in poor condition, I have described the ♀ at greater length.

♂. Length 12½ mm.

Resembling the ♀, *but differing as follows*:—the *most striking difference* is presented by the *coloration of the wings*; these are uniformly suffused with *pale brown*, which, though stronger in the costal and darkest in the subcostal cell, shows only the very faintest trace of concentration at the tip of the submarginal cell (none at all in the second specimen in the collection, in which the tint of the wings is considerably lighter); *the wings, therefore, do not present a blotched appearance*; the wings are also considerably narrower, the second longitudinal vein is straighter, and the terminal portion of the fourth vein, closing the first posterior cell, much more oblique: the dark stripe on the thorax, on each side of the narrow median cinereous one, is broader: the *abdomen* is *browner*, the *markings yellower*; second segment yellower at the

base, and with the band across the middle about twice as broad; third segment with a distinct narrow ochreous band across the base, widest in the middle and notched in the median line, tapering towards the sides (in the second specimen in the collection this band is merely represented by a faint line, but the specimen may have been captured very soon after it emerged), and with the main transverse band much broader; fourth segment with the "lunate" marks represented by two stripes running straight from the front to the hind margin; each of these sends off a narrow oblique mark from near its base towards the lateral margin, as do the corresponding marks in the ♀, and from its extreme base a narrow line runs to the lateral margin, along the base of the segment; fifth segment with a straight stripe running from the front to the hind margin on each side of the median line, and connected together posteriorly, but apparently with no trace of the small basal triangles: the *legs* are *paler yellow*, but the brown markings on the posterior pair and the posterior tarsi just as in the ♀. The *antennæ* are orange, short, the third joint rounded, and the second and third joints and the tip of the first narrowly dark brown above; the arista dark brown; the shining black spot above the antennæ narrower than in the ♀; the front is clothed with short dark pile. The *alulæ* and the *shape of the abdomen* as in the ♀; genitalia ochraceous.

Brazil, Villa Nova and Santarem (*Bates*): two specimens.

Baccha flavens, sp. n. (Plate V. fig. 10, ♀.)

♀. Length 12½ mm.

Yellow, nearly bare; dorsum of the thorax, except the sides, shining orange-rufous, with two abbreviated pale yellow stripes, which are clothed with shimmering whitish pollen: abdomen deep chrome-yellow, with narrow shining brown transverse bands and lineate markings; broad, flat, not contracted basally, but expanding regularly to the end of the fourth segment. Legs wholly yellow. Wings with an ochraceous tinge, strongest towards the anterior margin: alulæ rudimentary.

Face and *cheeks* pale yellow, shining, except the facial tubercle, which is dull. *Front* somewhat deeper yellow, dull, the posterior fifth dark olivaceous; the slight antenniferous projection shining, pale yellow on the sides; a conspicuous shining black dot above the base of the antennæ; above this is a small brown blotch, from which a faint rufous median stripe runs back to the vertex. First two joints of the *antennæ* ochreous; the third is missing. The yellowish shimmering pollinose stripes of the dorsum of the thorax only extend about two-thirds of its length, and divide the orange-rufous area into a median and two lateral stripes, which are all of equal breadth and coalesce posteriorly; the sides of the dorsum, pleuræ, pectus, and metanotum metallic yellow: *scutellum* dull, tawny ochraceous, orange-ochraceous at the base. *Abdomen*: first segment pale yellow, shining, with a narrow faint brownish band occupying the median two-fourths of the hind border; second segment with a straight brown transverse band occupying about the

posterior fifth; third segment with a similar brown transverse posterior band, which, however, is concave anteriorly for about a fourth of the width of the segment on each side of the median line; in the median line it is produced into a small angle, from which a faint brown median stripe extends forwards to within about one-seventh of the length of the segment from the anterior margin; fourth segment with the extreme hind margin and three triangles brown; two of the triangles are lateral in position, one in each posterior angle, and extend forwards and inwards to about the middle of the segment; the third is median, and narrower than the other two, and is prolonged as a median stripe to the anterior margin, before reaching which, however, it becomes faint; the markings on the fifth segment are similar to those on the fourth, but narrower, and the lateral triangles are so prolonged that they are only narrowly separated from the anterior margin; the median triangle, too, is here represented by a stripe, which, while expanding slightly posteriorly, is only about half the width of the median stripe on the preceding segment, and (in the typical specimen at least) is separated by about one-eighth of the length of the segment from the anterior margin; on the short sixth segment the lateral triangles (here almost reduced to stripes) reach the anterior margin without becoming indistinct, while the median triangle is represented by a small, but sharply defined, triangular spot, with its base in the centre of the anterior margin and its apex in the middle of the segment. The third longitudinal vein of the wings is nearly straight, and only slightly concave posteriorly; distal half of subcostal cell dark ochraceous; knobs of halteres ferruginous.

Brazil, region of the Amazons (*Bates*): one specimen.

In the markings of the abdomen this species somewhat resembles *B. gilva*, but is at once distinguished by the colour of the dorsum of the thorax, as well as by the deeper colour of the scutellum and abdomen, and by its larger size.

Baccha gilva, sp. n. (Plate V. fig. 7, ♂.)

♂. Length 9½ mm.

Pale yellow: thorax metallic brown in centre of dorsum, abdomen with brown transverse bands and other markings; the abdomen is flat, broad, not contracted at the base, but expanding regularly to the hind margin of the fourth segment. Wings with a yellowish tinge, especially towards the base; veins yellow, the auxiliary and first longitudinal veins orange: alulæ rudimentary.

Face and *cheeks* pale yellow, shining, the low facial tubercle dull, the face receding. *Front* yellow, with a black dot on the anterior face of the antenniferous projection; the front clothed with brown pile, the upper part of the face below the antennæ also with darkish pile; vertical triangle elongated, though not very narrow, cinereous pollinose, the ocelli remote from the vertex; occiput fringed at the sides with golden yellow hairs. *Antennæ* orange, third joint rounded; arista brown, yellow at the base. *Thorax*

metallic yellow on the sides of the dorsum and on the pleuræ, metanotum and a faint patch on each side above the middle coxæ brown. *Scutellum* dull yellow. *Abdomen*: second segment with a narrow, posteriorly concave, pale brown transverse band near the hind margin; third segment with a brown transverse band which is very narrow and close to the hind margin in the middle, but at the sides is broader, reaches to the hind margin, and has a ragged anterior edge; fourth segment with the extreme hind margin, a small median posterior triangle prolonged into a faint median line which almost reaches to the anterior margin of the segment, and a quadrate area in each posterior angle, occupying about one-third of the length of the segment, brown; the inner anterior angles of the quadrate areas are considerably prolonged, so that they run like a sharp thorn into the yellow portion of the segment on each side; fifth segment nearly wholly yellow, a narrow median stripe starting from the anterior margin of the segment, but becoming obsolete about halfway, and an ill-defined patch in each posterior angle, from which a faint and almost obsolete streak runs forwards and slightly inwards, faintly brown; genitalia brown at the tip: the abdomen is clothed with very short and sparse appressed black pile; the thorax and scutellum almost bare. *Legs* uniformly pale yellow; first joint of posterior tarsi slightly swollen. *Wings* rather narrow; third longitudinal vein concave posteriorly; subcostal cell orange.

Brazil, region of the Amazons (*Bates*): one specimen.

Baccha crocata, sp. n. (Plate V. fig. 5, ♀.)

♀. Length 7½ to 9½ mm.

Saffron-yellow; abdomen with brown bands and indentations, centre of dorsum of thorax shining brown, with yellowish cinereous pollinose stripes: wings suffused with saffron-yellow, somewhat darker on the basal half along the costal side; alulæ rudimentary: legs wholly yellow; the posterior femora of the smallest specimen have a narrow incomplete faint brownish band towards the tip.

Face and *cheeks* pale opalescent yellow, clothed with short pale pile; face tuberculate, receding. *Front* saffron-yellow, pollinose, rather more than the posterior third cinereous-bronze pollinose, from which a sharply defined brown median stripe runs to the base of the antenniferous projection; in a smaller specimen (7½ mm. in length) this stripe is broader and runs right over the antenniferous projection to the base of the antennæ; immediately above the antennæ is a round black dot. *Antennæ* orange, short, third joint rounded, arista brown, yellow at the base; ocelli remote from the vertex. Occiput fringed with golden-yellow hairs. The pollinose stripes of the dorsum of the thorax consist of a very fine median one, and a much broader stripe on either side of this; all three are abbreviated before reaching the scutellum, but the median one is somewhat the longer; the brown stripe outside each lateral pollinose one is the broadest and darkest of all, and is divided by the transverse suture: the sides of the dorsum and

the pleuræ are shining metallic; above the middle coxæ a faint brownish opalescent stripe extends upwards and backwards to the metanotum, which is dark metallic. *Scutellum* wholly saffron-yellow. *Abdomen* flat, broad, not contracted at the base, but expanding regularly to the end of the fourth segment; like the thorax, it is almost bare; first segment pale yellow, with a tuft of yellow hairs on each side; second segment with rather more than the basal third brown, narrowly yellowish at the extreme base, and with a shining reddish-brown band on the hind margin, in front of which is a narrow dark brown transverse band, which is slightly concave posteriorly; the yellow area of the segment therefore takes the shape of a fairly broad transverse band; the brown basal area is sometimes fainter, and the segment then appears yellowish at the base also; third segment shining reddish brown on the posterior margin, in front of which is a narrow transverse brown band, which projects on each side into a small angle at about a fifth of the width of the segment from the lateral margin; from the anterior margin a brown spot shaped like a spear-head projects backwards in the median line, and is narrowly connected by an almost obsolete median stripe with the posterior transverse band; from the anterior third of the lateral margin a tongue-shaped brown mark projects inwards on each side, leaving the actual anterior margin of the segment yellow; on the fourth segment the markings are a modified representation of those on the third; there is a narrow shining brown posterior border, which expands into a dull brown quadrate area on each side, from which a greatly prolonged acute angle projects forwards and slightly inwards, extending to within one-fourth of the length of the segment from the anterior margin; the median line is occupied by a fairly broad and sharply defined stripe, which expands at each end, but the tongue-shaped mark which is seen projecting inwards on each side of the preceding segment in front is here much reduced and sometimes almost obsolete; the width of the yellow marks on this segment varies in different specimens, and in the typical individual those on either side of the median stripe extend to the hind margin; the markings on the fifth segment are arrived at by a still further modification of the foregoing; in this case the brown marks take the form of a median stripe, expanded towards each end, and of a curving piece projecting forwards from each posterior angle and nearly reaching to the anterior margin; the lateral margins of the segment are also narrowly brown; the sixth segment, which is very small, is brownish on each side, and has a narrow median stripe extending almost to the hind margin; the brown marks are, however, not visible in the typical specimen. Third longitudinal vein of the wings straight, curving downwards at the tip.

Brazil, region of the Amazons (*Bates*): two specimens.

In addition to the above, there is also in the collection a small male, which I regard as belonging to this species; it is, however, too much damaged to describe, and I have therefore made a female

the type of the species: the specimen in question is about 8 mm. in length, and resembles the female in general appearance; the *face* and *cheeks* are, however, saffron-yellow, instead of pale yellow; the frontal triangle has a brownish median stripe extending from the antenniferous projection nearly to the angle of the eyes: the *abdomen* is narrower, and somewhat contracted and cylindrical at the base; the first segment is brownish in the centre; the third segment has a fairly broad posterior brown band, with the lateral angles only faintly indicated; the median brown mark projecting from the anterior margin is oval in shape, and does not extend further than one-fifth the length of the segment; the *wings* are somewhat browner, and less yellow, but this is also the case in the smaller of the two females mentioned above; the posterior femora have a narrow incomplete brownish band beyond the middle.

This specimen is likewise from the region of the Amazons (*Bates*).

BACCHA CROCEA, sp. n. (Plate V. fig. 6, ♂.)

♂. Length 8¼ to 9 mm.

Closely allied to B. crocata; *saffron-yellow; thorax metallic, very shining, brown in the centre of the dorsum, with two narrow abbreviated yellow stripes; abdomen narrow at the base, but expanding regularly to the end of the fourth segment, with brown bands and indentations, but the third segment with no brown at the basal angles; wings suffused with pale brown, alulæ rudimentary; legs yellow, posterior femora with a narrow but distinct brownish band beyond the middle, darkest on the outer side.*

The chief differences between this species and crocata *appear in the front, thorax, and third segment of the abdomen*: the *front* is shining yellow, instead of dull orange (the black dot above the base of the antennæ is present); the *thorax* is very shining, and the narrow yellow stripes which are situated on either side of the median line are due to the ground-colour, and not to pollen; the metanotum is brownish, but there is no dark stripe extending backwards to it from above the middle coxæ; the first abdominal segment is brown in the centre, as is the case in the specimen which I have considered as a male of *crocata*, but the absence of brown from the basal angles of the third segment gives that segment quite a different appearance; there is likewise no brown in the basal angles of the fourth segment, but this, so far as its damaged condition permits me to judge, is likewise the case in the specimen I consider to be a male of *crocata*; in other respects the brown markings of the abdomen are almost precisely similar to those seen in *crocata*; the median brown stripe on the fourth segment stops short of the anterior margin in the typical specimen, but reaches it in the other example in the collection; the wings are less infuscated than in the supposed male of *crocata*, and are somewhat narrower and longer; the third longitudinal vein is straighter, and the terminal portion of the fourth vein, closing the first posterior cell, less sinuate.

Brazil, region of the Amazons (*Bates*): two specimens.

BACCHA FERVIDA, sp. n. (Plate V. fig. 11, ♂.)

♂. Length 10 mm.

General colour orange; abdomen deep dull orange, with metallic brown posterior borders to the segments, flat, not contracted basally, but expanding regularly to the end of the fourth segment: wings suffused with brown, slightly paler towards the tips; alulæ of full size.

Face and *cheeks* pale yellow, thinly clothed with pale yellow pile; the face receding, with a very small tubercle. *Front* orange pollinose, with a brown median stripe from the angle of the eyes to the upper margin of the very slight antenniferous projection; the latter pale orange in front, shining, with a black dot above the antennæ; the front clothed with brown pile. *Antennæ* orange, short, third joint rounded at the tip, with the upper margin brown; arista brown, yellowish at the base; vertical triangle bronze, black at the apex, long, narrow; ocelli remote from the vertex. *Dorsum of thorax* metallic orange, somewhat iridescent, not pollinose, with three narrow faint brown stripes (one median and one on either side of it), which do not reach more than halfway: *pleuræ* metallic yellow; *scutellum* dull saffron-yellow. *Abdomen*: first segment brownish orange; second segment with a metallic transverse band on the anterior as well as the posterior fourth; this segment is somewhat shining, especially in the median line; on the third segment the metallic brown transverse band on the posterior fourth expands somewhat towards the sides, and there is a semi-obsolete faint brown median stripe, extending from the anterior margin to the posterior border; on the fourth segment the posterior band is only about half the width of that on the third, but it expands into a median triangle, which is connected by a faint brown stripe with the anterior margin, and also into a quadrate area on each side, which occupies rather more than half the length of the segment; the median stripe is somewhat clavate at its anterior extremity, and this is also the case with the similar stripe on the third segment; the fifth segment is wholly shining, and the brown portion is about equal to the orange in area; the posterior border is, however, much narrower, while the median stripe is broader and more sharply defined than on the previous segments, and that which corresponds to the brown lateral quadrate areas on the fourth segment is here represented by an ovate mark on each side, extending nearly to the anterior margin and situated nearer the middle line, so that the lateral margin of the segment as far as the posterior border is orange; the orange portion of the fifth segment on each side of the median stripe is therefore deeply indented by a brown notch; genitalia brown at the tip: with the exception of a tuft of pale yellow hairs on each side of the first segment, the pile on the abdomen is black, appressed, and very short and sparse, though it is somewhat longer on the fifth segment. *Legs* yellow; posterior pair deeper orange, but without bands. Third longitudinal vein

straight; *terminal section of fourth vein, closing first posterior cell, very upright.*

Santarem, R. Tapajos, Brazil (*Bates*): one specimen.

Ascia striata, Wlk., Dipt. Saund. 221, from Brazil, is *not* an *Ascia*: it must be placed in a new genus closely allied to *Baccha*, which it resembles in every particular except the terminal section of the fourth vein, closing the first posterior cell, which is straight and perpendicular.

Baccha tripartita was described by Walker, Journ. Linn. Soc. v. 285, from Batchian, the typical specimen being a ♂. Subsequently (Journ. Linn. Soc. vii. 212) Walker mentioned a second specimen from Mysol. There is only one specimen in the collection, a ♂ from Mysol. This is labelled "*tripartita*" in Walker's handwriting, and may really be the type, as the Mysol label may have been attached in mistake for a Batchian one. The specimen agrees with the description.

Baccha dispar, Wlk., Journ. Linn. Soc. iii. 121, from Macassar, Celebes; length of the type (a ♂) 12½ mm.

Baccha basalis, Wlk., Journ. Linn. Soc. v. 239, from Dorey, New Guinea: Walker writes "hind tibiæ with a piceous subapical band;" there is only the faintest trace of such a band on the tibiæ, but a well-marked one on the hind femora, which are probably what Walker was looking at.

Baccha purpuricola, Wlk., Journ. Linn. Soc. iv. 129, from Key I., Aru Is.: length of body 6 lines (not 5½ as stated by Walker); length of each wing 5 lines.

Syrphus subchalybeus, Wlk., Tr. Ent. Soc. n. ser. iv. 157, from the Valley of the Amazon, is a *Baccha* belonging to Group II.

Paragus? scutellaris, Wlk., Trans. Linn. Soc. xvii. 342, from São Paulo, Brazil; *Baccha babista*, Wlk., List. Dipt. iii. 549, from Georgia; and *Baccha varia*, Wlk., List. Dipt. iii. 548, from ——, are all synonyms of *Baccha clavata*, F.

Salpingogaster, Schin.

Salpingogaster virgata, sp. n. (Plate V. fig. 3, ♂.)

♂ ♀. Length 14½–17½ mm.

Thorax pale yellow; the dorsum, except the lateral margins, dark brownish, with a cinereous pollinose stripe on each side of the median line, and a faint bronze stripe close to the yellow margin on each side; *the pleuræ with a narrow brown stripe running from the base of the wing to the middle coxa, and a sometimes broader but interrupted and abbreviated stripe on each side of the metanotum*; metanotum metallic dark brown; *scutellum* yellow, with a sharply defined central area dark brown; *abdomen* ferruginous, that of the ♂ ending in a minute spine, and with processes beneath the fourth segment; *wings* with a faint ochraceous tinge, darker along the fore-border; *alulæ* rudimentary; *legs* ochre-yellow, the distal portion of the posterior femora, a fainter and narrower band on the middle of the posterior tibiæ, and the

posterior tarsi ochraceous rufous; the femora are grooved below towards the tips, and the middle ones bear a small angular process on the posterior side of the groove at the tip; there is a similar but smaller process on the front femora, which, however, is scarcely visible in the ♀; the middle as well as the posterior femora bear small spines below; in the case of the middle femora these are chiefly confined to a line extending backwards on each side of the groove, but on the posterior pair they are scattered about on the middle portion of the underside, as well as running along the ridges bordering the groove.

Face and *cheeks* pale yellow in the ♂, somewhat deeper yellow in the ♀, the facial tubercle small; *front* yellow, the vertical triangle in the ♂ and the posterior portion as far as the ocelli in the ♀ black; the antenniferous process small, but prominent, a shining black spot above the base of the antennæ, and the median portion of the antenniferous process above black; in the case of the ♀, the *front* with a median black stripe extending forwards from the ocelli rather more than two-thirds of the distance between them and the base of the antenniferous process, expanding towards and forked at the tip: *antennæ* ochraceous, third joint rounded at the tip; arista dark brown, pale yellow at the base. *The cinereous pollinose stripe on each side of the median line of the thorax is very conspicuous*; the stripes are only narrowly separated in front and fuse together posteriorly; they almost reach the scutellum; outside these is a dark brown stripe on each side, and then comes a pale greenish-bronze stripe, outside which, again, is a very narrow brown stripe; this is joined behind the transverse suture by the pleural stripe, which runs to and extends down the middle coxæ; the stripes outside the cinereous pollinose ones are divided by the transverse suture; the cinereous pollinose stripes are carried forward to the anterior margin of the thorax, with a narrow dark brown border on each side; the remaining stripes are abbreviated in front. *Abdomen*: the first segment with a conspicuous posterior border dark brown, not quite reaching to the sides; the remainder of the segment yellow; second segment yellow in the extreme basal angles, and also with an indistinctly defined yellowish blotch on each side in the middle; the posterior border of the second segment may be narrowly brown; in three of the specimens in the collection there is an indication of a pale yellowish mark on each side near the base of the third segment; the posterior margin on the underside of the fourth segment of the ♂ is raised and excavated, and bears two somewhat hammer-shaped processes, and the anterior margin of the segment on the underside is also excavated; the sixth segment in the ♂, which ends in the small spine, is globate; in two specimens in the collection the abdomen is of a chestnut colour, and blackish towards the tip, but this is probably due to drying. In the *wings* the sub-costal cell is dark tawny, and the infuscation of the fore-border includes the distal third of the submarginal cell; the central portion of the marginal cell is more ochreous, and the basal

portion of the spurious vein is bright ochreous, tinging the adjoining portion of the wing; the kink in the third vein is angular, and situated slightly before the middle of the first posterior cell.

Brazil, region of the Amazons (*Bates*): five specimens.

This species is closely allied to *Salpingogaster pygophora*, Schin., but differs from it in the colour of the sides of the thorax and in that of the scutellum. In the colour of the scutellum and the markings of the dorsum of the thorax it agrees with *Salpingogaster nigra*, Schin., but differs from that species in the face being wholly yellow, as also in the colour of the sides of the thorax, of the femora, and of the tibiæ, and in the peculiar shape of the external genitalia of the ♂, in which it agrees with *S. pygophora*.

SALPINGOGASTER MINOR, sp. n. (Plate V. fig. 4, ♀.)

♀. Length 12 mm.

Thorax ochraceous above, dull, *with three* dull *black stripes*; pleuræ shining ochre-yellow, *a narrow brown stripe running from the base of the wings to the middle coxæ*, and an indication of a broader and darker but shorter one on each side of the metanotum; the metanotum not infuscated; *scutellum* yellow, the disc brown; *abdomen* ochraceous, base of first segment yellow; second segment with a faint reddish-brown band on the basal third; the central portion of the fourth, fifth, and sixth segments, and of the posterior half of the third, dark brown; the darker area is, however, not sharply defined, and may be due to drying or to matter contained in the abdomen. *Wings* with an ochraceous tinge, which is deeper in the costal cell; subcostal cell tawny, the marginal cell, the distal third of the submarginal, the space between the kink in the third vein and the terminal portion of the fourth vein closing the first posterior cell, as well as the space outside this and outside the discal cell, brownish; the basal half of the spurious vein ochre-yellow, tinging the adjoining portion of the wing; the kink in the third vein rounder than in *S. virgata*, and situated slightly beyond the middle of the first posterior cell; the *posterior cross-vein nearly straight*: *alulæ* rudimentary. *Legs* pale yellow, the posterior femora and tarsi ochraceous; *none of the femora are grooved beneath*, but the posterior pair have a double row of short thin spines underneath towards the tips; *the middle femora have no angular process at the tip beneath*.

The *head* is *considerably flattened antero-posteriorly*; *face* and *cheeks* wholly pale yellow, shining, facial tubercle small, sharp; proboscis ochraceous; antenniferous projection well-marked, shining black on the sides and above; the posterior third of the *front*, including the ocelli, which are remote from the vertex, shining black; the antenniferous process is connected with this by a triangular patch, the base of which, resting on the antenniferous process, as well as a narrow median line, is metallic black, the rest dead black; on each side of the front below the ocelli is a narrow yellow stripe, running into the yellow of the face; *antennæ* ochra-

ceous rufous, third joint rather broad (actually larger than in *S. virgata*, although the insect itself is smaller), rounded at the tip; arista dark brown; the black stripes on the dorsum of the thorax consist of a very narrow median one, and a broader one on each side of it; the stripes converge posteriorly, and apparently fuse a short distance before the scutellum, which they do not reach; each of the broader black stripes is separated from the narrow median one by a stripe of the ground-colour rather broader than itself; there is an indication of a faint brown stripe on each side of the dorsum, with a conspicuous dark brown spot behind the suture, where it is joined by the brown stripe of the pleuræ, which curves round the front of the base of the wing; there is also a dark brown spot beneath the shining yellow post-alar callosities.

Brazil, Para (*Bates*): one specimen.

This species is distinguished, by the markings of the dorsum of the thorax, from any other Salpingogaster *yet described.*

Brachyopini, Williston.

Synopsis N. Amer. Syrphidæ, Bull. 31, U.S. Nat. Mus. p. xxii.

Rhingia, Scop.

Rhingia semi-cærulea, sp. n. (Plate V. figs. 1, 2, ♂.)

♂. Length 11½ mm.

Dorsum of thorax deep metallic blue round the sides, greenish bronze on the central area; scutellum metallic blue, darkish bronze at the base in the centre; pectus and pleuræ metallic plum-purple, some of the divisions with ochraceous undertints; abdomen brassy ochraceous, pale yellowish at the base, hind margins of the segments narrowly black; wings with a very faint ochreous tinge, nearly hyaline, the subcostal cell not darker; halteres yellow; legs yellow, the last four joints of the posterior tarsi brown.

Face, epistoma, and *frontal triangle* shining ferruginous; vertical triangle dark blue; *antennæ* ferruginous, rather more than the basal half of the arista yellow, the rest brown; *thorax* and *scutellum* finely punctate, clothed with short dark pile; post-alar tubercles ochraceous rufous, with a purplish blotch on the outside. *Abdomen*: first segment pale yellowish, with the black hind-margin confined to a very narrow streak on each side of the median line, not reaching to the sides; second segment yellowish on the basal two-thirds, then brassy ochraceous, like the remainder of the abdomen; the shining black hind-margins of this and the two following segments are very sharply defined; the second segment has a fringe of pale yellow pile on each side, longer towards the base; third and fourth segments thinly clothed with pale yellow pile, which is longer on the fourth segment.

Sierra Leone (*Foxcroft*): one specimen.

This species is allied to *Rh. cærulescens*, Lw. ('Dipterenfauna Südafrika's,' p. 302 [374], from Caffraria, but is distinguished at once by the colour of the thorax and abdomen.

Since Loew's memoir no addition has been made to the extra-European species of *Rhingia* mentioned by him (*loc. cit.*): these are *Rh. nasica*, Say (J. Acad. Phil. iii. 94; Compl. Wr. ii. 81; Wiedemann, Auss. zw. Ins. ii. 115; Williston, Synopsis N. Amer. Syrphidæ, Bull. U. S. Nat. Mus. No. 31, p. 130), from North America; *Rh. nigra*, Macq. (Dipt. Exot. i. Suppl. p. 133, t. 11. fig. 10), from Colombia; and *Rh. lævigata*, Lw. (Wien. ent. Monatschr. Bd. ii. p. 107), from Japan.

From specimens in the Museum Collection I am able to state that *Lycastrirhyncha nitens*, Bigot (Plate V. figs. 15, 16) (Rev. et Mag. Zool. 1859, p. 307), from the Amazons, which Bigot afterwards (Ann. Soc. Ent. Fr. 6e série, t. i. 1881, p. 373) thought to be a *Rhingia*, and identical with *Rh. nigra*, Macq., has nothing whatever to do with *Rhingia*, but is one of the *Eristalini*. The genus *Lycastrirhyncha* is a perfectly good and very remarkable one, which is characterized by possessing the body, wings, and legs of an *Eristalis* and the head of a *Rhingia*, with a somewhat elongated epistoma. The position of the anterior cross-vein of the wings and the thickened posterior femora are in themselves sufficient to dispose of all doubt as to the true affinities of the genus.

The genus *Lycastris* of Walker (Trans. Ent. Soc. Lond. n. ser. vol. iv. p. 155,—founded for a species from India), which Bigot likewise proposes (*loc. cit.*) to sink in favour of *Rhingia*, is allied to *Criorhina*!

Brachyopa rufo-cyanea, Wlk. (Ent. Mag. ii. 472), from New Holland, is a *Cyphipelta*, Bigot (Rev. et Mag. Zool. 1859, p. 307), and = *C. conifrons*, Bigot, *loc. cit.* (= *Eristalis vesicularis*, Erichs., —Wiegmann's Archiv, 1842, 272), which is the type of the genus. Walker's species was published in 1834, and therefore his name has the priority. This species is the only one of the genus hitherto described. Bigot stated that the genus is most closely allied to *Volucella*, but it has been shown by von Röder (Wien. ent. Z. i. 61), who re-described the genus, that its proper position is nearest *Rhingia*.

EXPLANATION OF THE PLATES.

PLATE IV.

Fig. 1. *Ocyptamus iris*, sp. n., ♀, p. 133.
2. *Baccha amphithoe*, Wlk., ♀, p. 142.
3. —— *sulica*, sp. n., ♀, p. 144.
4. —— *refulgens*, sp. n., ♀, p. 138.
5. —— *triangulifera*, sp. n., ♂, p. 138.
6. —— *bicolor*, sp. n., ♂, p. 137.
7. —— *nubilipennis*, sp. n., ♂, p. 136.
8. —— *signifera*, sp. n., ♂, p. 145.
9. —— *nubilipennis*, sp. n., ♀, p. 136.
10. —— *pulchrifrons*, sp. n., ♂, p. 139.
10a. Head of ditto from above, enlarged.
11. *Baccha pulchrifrons*, ♀, p. 139.
12. —— *fallax*, sp. n., ♂, p. 142.
13. —— *incompta*, sp. n., ♂, p. 147.
14. —— *sagittifera*, sp. n., ♀, p. 144.
15. —— *levissima*, sp. n., ♂, p. 146.

PLATE V.

Fig. 1. *Rhingia semi-cærulea*, sp. n., ♂, p. 162.
2. —— ——, head in profile, p. 162.
3. *Salpingogaster virgata*, sp. n., ♂, p. 159.
4. —— *minor*, sp. n., ♀, p. 161.
5. *Baccha crocata*, sp. n., ♀, p. 155.
6. —— *crocea*, sp. n., ♂, p. 157.
7. —— *gilva*, sp. n., ♂, p. 154.
8. —— *cultrata*, sp. n., ♂, p. 152.
9. —— ——, ♀, p. 151.
10. —— *flavens*, sp. n., ♀, p. 153.
11. —— *fervida*, sp. n., ♂, p. 158.
12. —— *pumila*, sp. n., ♂, p. 148.
13. —— *silacea*, sp. n., ♂, p. 149.
14. —— *nubilipennis*, sp. n., ♂, head in profile, p. 136.
15. *Lycastrirhyncha nitens*, Big., ♀, p. 163.
16. —— ——, head in profile, p. 163.

3. On two new Species of Copepoda from Zanzibar.

By GILBERT C. BOURNE, M.A.

[Received December 13, 1892.]

(Plate VI.)

So little is known of the Entomostraca of Africa, that I gladly availed myself of the opportunity of examining a portion of sandy mud, brought by Mr. Finn, of Brasenose College, Oxford, from the neighbourhood of Zanzibar, which was kindly supplied to me by Mr. F. E. Beddard.

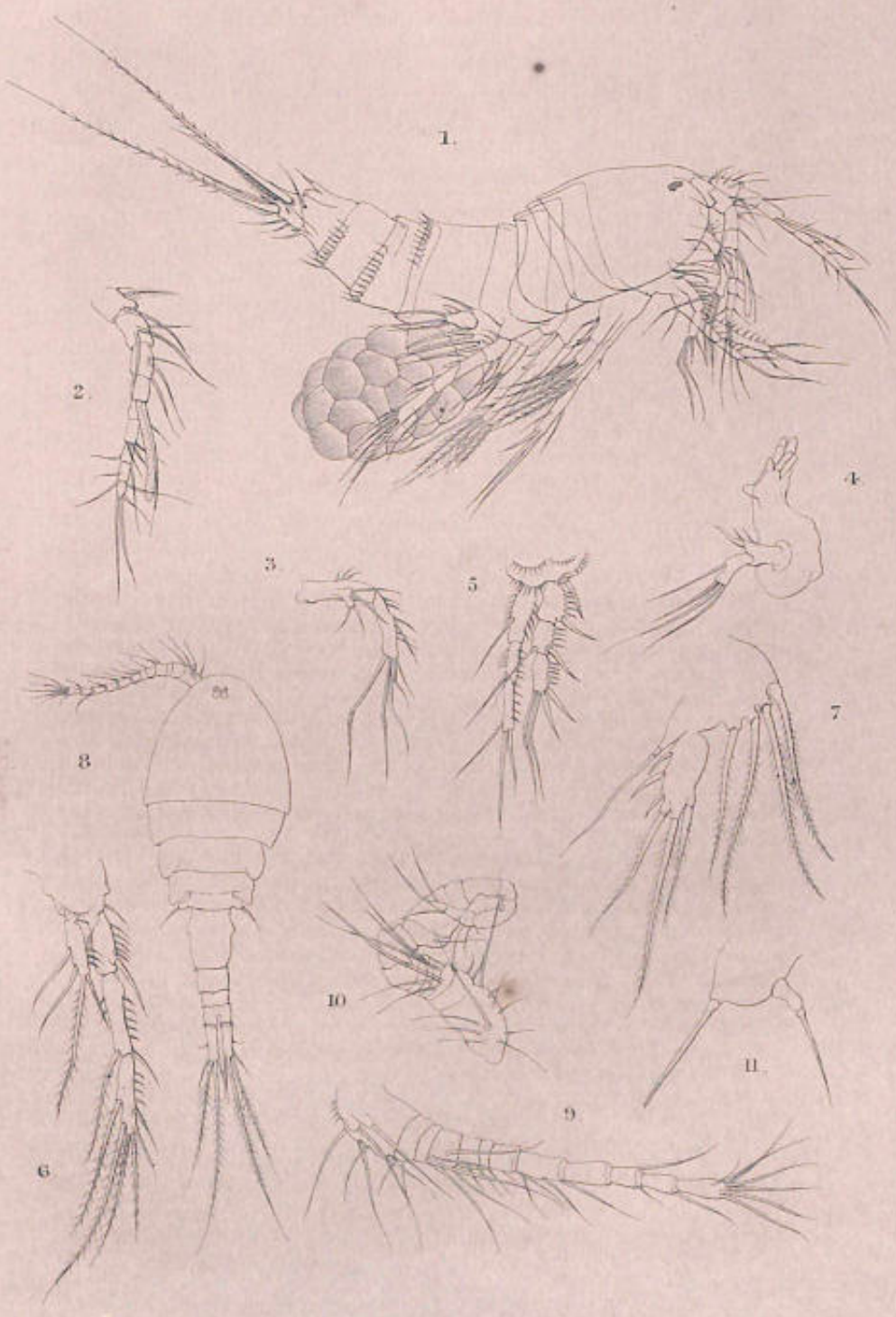
The result of my search was rather disappointing, as I only succeeded in finding a few minute Copepoda, belonging to two species, which I now describe. Of these one is doubtfully a new species, being closely allied to *Cyclops orientalis*, Uljanin, from Turkestan. The other is a well-marked species of *Canthocamptus*.

In publishing a description of these two forms, I may take the opportunity of pointing out how much may be done by travellers and explorers in Africa in the matter of collecting freshwater Crustacea. These forms are easily collected and preserved, and from their generally minute size are easily carried. It is probable that the great lakes of the interior have a peculiar and interesting Crustacean fauna which would well repay collection. Those who have read Weismann's charming essay, 'Das Thierleben im Bodensee,' will recognize what a wide field of study is here open to the traveller and collector.

Fam. HARPACTIDÆ.

CANTHOCAMPTUS FINNI, n. sp. (Plate VI. figs. 1–7.)

Anterior antenna 9-jointed, the last joint very small; fourth joint bearing one long and one modified seta. Inner branch of 2nd antenna well developed, 1-jointed, bearing two terminal and two



J. Smit lith.

Mintern Bros. imp.

NEW COPEPODA FROM ZANZIBAR.

lateral setæ. Mandible stout, the palp well developed, the basal joint produced in a sharp process, the outer joint bearing three terminal and one lateral seta. First pair of feet having the inner branch 3-jointed, the proximal and distal joints subequal in length, the middle joint rather more than half the length of the other two; all three joints denticulate on their outer margins. The outer branch reaches as far as the first third of the distal joint of the inner branch, and is provided with two terminal geniculate setæ and a stout external spine on each joint. Inner branch of the 2nd, 3rd, and 4th swimming-feet 2-jointed, the proximal joint minute; outer branch 3-jointed, each joint denticulate along its outer margin and bearing a powerful spine. Basal joint of the fifth pair of feet broad, the inner segment bearing four stout plumose setæ. The second joint ovate, somewhat elongate, bearing three plumose terminal setæ and three external marginal spines, of which the middle is twice the length of the other two. Posterior margin of the first abdominal segment strongly denticulate dorsally, the two succeeding segments denticulate ventrally. Furca short; caudal setæ minutely aculeate and half as long as the whole body.

This is a well-marked species, agreeing with *C. northumbricus* and *C. trispinosus* in the characters of the 2nd, 3rd, and 4th swimming-feet, which are two-jointed, and in the nine-jointed first antennæ; but differing from both in the form of the mandible-palp, in the inner branch of the second antennæ, in the proportions of the first pair of swimming-feet, and in the characters of the fifth pair of feet of the female.

Fam. Cyclopidæ.

Cyclops africanus, n. sp. (Plate VI. figs. 8–11.)

Cephalothorax ovate, evenly rounded in front. The first and second free thoracic segments of equal length, the third about two-thirds the length of the two preceding segments. Abdomen long and narrow, its length, not including the furca, equal to the four free thoracic segments. The first abdominal segment in the female long, equal in length to the three succeeding segments. The last abdominal segment finely denticulate on its posterior margin. Furcal segment equal in length to last two abdominal segments. Of the caudal setæ the two outermost are short, the internal median seta very long, equal in length to the whole abdomen and the last two thoracic segments.

The first antennæ of the female 12-jointed, rather shorter than the first joint of the cephalothorax. First antennæ of the male 14-jointed, the basal joint equal in length to the next six joints. Hinge-joints between the 7th and 8th and 12th and 13th joints; the 9th to the 11th joints inclusive swollen. Mandible-palp consisting of a well-developed basal piece bearing two long and one short seta. Maxillæ, maxillipeds, and swimming-feet as in *C. orientalis*. Fifth pair of feet rudimentary, resembling those of *C. orientalis*.

I have much hesitation in separating this species from *C. orientalis*, Uljanin, from which it differs chiefly in the proportions of the abdominal segments, in the size of the third free thoracic segment, which is larger than in *C. orientalis*, and in the size of the fused head and first thoracic segment, which in *C. orientalis* is equal in length to the four free thoracic segments and the first abdominal segment, while in *C. africanus* it is much shorter. I have not been able to find a female carrying ova, but the specimen from which the description is taken had its ovaries full of ripe ova.

The single male specimen I found was apparently mature. It differs markedly in the jointing and in the proportions of the antennæ from Uljanin's figure, which is very probably taken from an immature specimen.

EXPLANATION OF PLATE VI.

Canthocamptus finni, p. 164.

Fig. 1. Lateral view of female.
2. First antenna of female.
3. Second antenna.
4. Mandible.
5. First swimming-foot.
6. Fourth swimming-foot.
7. Fifth foot of female.

Cyclops africanus, p. 165.

Fig. 8. Female, viewed from above.
9. First antenna of female.
10. First antenna of male.
11. Fifth foot.

4. Remarks on a rare Argentine Bird, *Xenopsaris albinucha*. By P. L. Sclater, M.A., Ph.D., F.R.S., Secretary to the Society.

[Received December 22, 1892.]

(Plate VII.)

In 1868 our late distinguished Foreign Member, Dr. H. Burmeister, of Buenos Ayres, described, in a communication to this Society on additions to the Argentine Avifauna, a small Passerine bird of which he had obtained specimens in the sedge of the shores of the Rio de la Plata, near Buenos Ayres, under the name of *Pachyrhamphus albinucha*. No specimen accompanied this communication, and the subject appears to have been until quite recently overlooked by subsequent writers. Although the title of the paper was given by Mr. Hudson and myself in the Appendix to our 'Argentine Ornithology' (*op. cit.* ii. p. 222), and it is there recorded that *Pachyrhamphus albinucha* was described as new, the species was unfortunately forgotten in the body of that work. The same was the case, I regret to say, in the fourteenth volume of the



J. G. Keulemans del. et lith.

Mintern Bros. imp.

XENOPSARIS ALBINUCHA.

'Catalogue of Birds in the British Museum,' in which all reference to *Pachyrhamphus albinucha* was unaccountably omitted.

In 1891 Mr. Ridgway discovered a specimen of *Pachyrhamphus albinucha*, received from Dr. Burmeister himself, among the treasures of the U. S. National Museum, where it had lain unnoticed for 17 years, and gave an excellent account of it in the 'Proceedings of the U. S. National Museum,' no. 870, which, according to the list of the "dates of publication" printed along with the "Contents," was published on Oct. 22nd of that year. Mr. Ridgway pointed out that the bird is not a true *Pachyrhamphus*, and instituted a new genus, "*Xenopsaris*," for its reception, referring it to the subfamily Lipauginæ of the Cotingidæ.

At about the same date as the rediscovery of this little bird at Washington, an example of it, transmitted by Herr Fritz Schulz, appears to have reached another centre of ornithological work, Berlin, and to have attracted Dr. Cabanis's attention. Dr. Cabanis also recognized the necessity of separating this form from *Pachyrhamphus*, and referred it to a new genus of Tyrannidæ, "*Prospoietus*," to be placed near *Serphophaga*.

On reading these two notices, and knowing that there was no specimen of this peculiar bird in this country, I wrote to Dr. Carlos Berg, who had succeeded Dr. Burmeister in the Directorship of the National Museum of Buenos Ayres, and asked him to procure me some examples of it. This, in reply, he kindly promised to do if possible, and in the meantime sends for examination one of the typical specimens belonging to the Museum of Buenos Ayres, which I have now the pleasure of exhibiting. As regards the systematic position of this form I agree very nearly with Mr. Ridgway, and, in order to render the subject complete, I append to these remarks his generic and specific characters of this little-known bird very slightly modified.

Genus Xenopsaris.

Xenopsaris, Ridgway, Bull. U. S. N. Mus. xiv. p. 479 (Oct. 1891).
Prospoietus, Cab. Bericht orn. Gesellsch. Berlin, ix. p. 4 (Nov. 1891).

Char. gen. Similar to *Casiornis*, Bp., but bill very much smaller, narrower, and more elevated at the base, with culmen gradually curved throughout its length; nasal and rictal bristles much less developed; tail nearly as long as the wing, emarginate and rounded (*i. e.* double-rounded), the feathers rather narrow; primaries exceeding secondaries by more than length of bill; the second, third, and fourth quills nearly equal and longest; first primary equal to sixth; tarsus about equal to length of bill measured from the rictus; middle toe considerably shorter than tarsus (slightly less than exposed culmen); feathers of pileum lengthened and broad, forming, when erected, a full rounded crest; along each side of the lower back and rump a conspicuous tuft of pure white cottony feathers. Colour (both sexes) greyish above, with glossy

black full-crested pileum, the lower parts, sides of head (below eyes), nuchal collar, lores, and frontlet white.

XENOPSARIS ALBINUCHA. (Plate VII.)

Pachyrhamphus albinucha, Burm. P. Z. S. 1868, p. 635; Scl. et Huds. Arg. Orn. ii. p. 222.

Xenopsaris albinucha, Ridgw. Bull. U. S. N. Mus. xiv. p. 479 (Oct. 22, 1891).

Prospoietus albinuchus, Cab. Bericht orn. Gesellsch. Berlin, Bericht ix. p. 4 (Nov. 30, 1891); id. J. f. O. 1892, p. 126.

Entire pileum (except narrow frontal band) down to the middle of the eyes glossy black, with a slight bluish lustre; narrow frontal band (including nasal tufts), lores, suborbital region, ear-coverts, and entire under portion of head, neck, and body, white; a rather narrow greyish-white nuchal collar (immediately below the black pileum); hind neck and back uniform ash-grey; the secondaries and rump similar, but browner; wings, tail, and upper tail-coverts greyish brown, the wing-coverts narrowly and indistinctly margined with whitish, the tertials distinctly edged with white; tail darker than wings, especially towards the end, the shafts pale brown basally; outer tail-feather broadly edged and margined round end with white. Upper mandible black, lower greyish; feet dusky in dried skin.

Whole length 5·0 inches, wing 2·4, tail 2·3, tarsus 0·5.

Hab. Sedge-beds on the shores of the Rio de la Plata, near Buenos Ayres (*Burm.*).

February 14, 1893.

OSBERT SALVIN, Esq., F.R.S., Vice-President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of January 1893:—

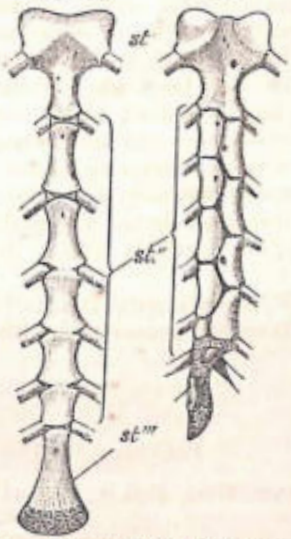
The total number of registered additions to the Society's Menagerie during the month of January was 104, of which 31 were by presentation, 3 by exchange, 62 by purchase, 3 by birth, and 5 on deposit. The total number of departures during the same period, by death and removals, was 122.

Prof. G. B. Howes, F.Z.S., exhibited an abnormal sternum of the Common Marmoset (*Hapale jacchus*), and made the following remarks thereon:—The specimen was obtained from one of six adult skeletons[1] recently macerated. The mesosternum consisted of five pairs of ossific elements, the anterior four of which were repetitionally symmetrical, but disposed alternately, instead of side by side as is most generally the case with the Mammalia. The fifth pair were comparatively insignificant and altogether invisible

[1] All epiphyses united.

from the ventral aspect owing to the approximation in the ventral middle line of their parent (seventh pair of) ribs, in the manner customary for other Mammals. Variability in ossification of the fully formed mesosternal segments of Mammalia, such as may bring about irregularities of the sternebræ with a more or less alternate disposition of the lower ends of the opposite sternal ribs, is no uncommon phenomenon, especially among the Primates; but it rarely affects the presternum[1]. In the case under consideration, the base of that segment was correspondingly asymmetrical, repeating, in relation to the first mesosternal segment,

Fig. 1. Fig. 2.



Sternum of *Hapale jacchus*, viewed from the inner (dorsal) aspect. 1. Normal. 2. Abnormal. Adults, nat. size.

st'. Presternum. *st''*. Mesosternum. *st'''*. Post- or xiphisternum.

the relations of this to its fellow next in order of succession behind. The mesosternum, while retaining, in respect to the independence of its constituents, a persistently embryonic condition, had so far increased in width during growth that the transverse diameter of each succeeding sternebra exceeded, at its narrowest point, that of the expanded base of its normal counterpart. Comparison with the normal adult (fig. 1) showed that the sternum, as a whole, had undergone an increase in breadth proportionate to reduction in length, due allowance being made for the occasional presence of but four distinct mesosternal segments[2]. When viewed from the inner aspect (fig. 2), the extreme regularity of

[1] See the skeletons of the Gibbon in the Museum of Natural History, and of the Orang in the Teaching Collection R. College of Science, South Kensington.

[2] Mivart, P. Z. S. 1865, p. 568.

recurrence of the parts gave the impression that the conditions met with might have been due to increased tension on the right side during growth. This was favoured by the fact that the right tibia and fibula, which were abnormal and angulated, bore traces of early fracture with subsequent synostosis, and by that of the non-distortion of the left anterior half of the presternum. It was, however, rendered the less likely by the fact that the xiphisternum, together with the posterior (fifth) mesosternal rudiment[1], was but feebly ossified; and by the fact that the former (fig. 1, *st'''*), instead of being posteriorly expanded as is most frequently the case with normal adults, was displaced to the left side, keeled along its left-hand border, and downwardly rotated. Although the departures from the normal met with in the sternum under consideration may conceivably have been due to purely mechanical causes, consequent upon the non-union of parts, they suggest the well-known characteristics[2] of that of the Anthropomorpha, among Primates; and, whatever their determining causes, the regularly recurring alternation of the mesosternal elements of opposite sides is especially interesting in this conjunction, as that has been independently recorded by Parker[3] and Flower[4] for the (apparently normal) developing sternum of the Orang.

Prof. T. Jeffery Parker, D.Sc., F.R.S., read a Memoir on the Cranial Osteology, Classification, and Phylogeny of the *Dinornithidæ*, of which the following is an abstract:—

The author begins by giving a brief account of his material, amounting altogether to about 120 skulls, most of them in the Otago University Museum, Dunedin, Canterbury College, Christchurch, New Zealand, and the British Museum (Natural History). Two specimens, one of *Emeus*, sp. α, in the Dunedin Museum, and one of *Mesopteryx*, species β, in the Wellington Museum, are quite perfect.

Many of the skulls examined could not be assigned with certainty to any known species, having been found quite apart from the rest of the skeletons; they are distinguished in the paper by Greek letters in order to avoid confusion with certain species designated by English letters by Mr. Lydekker. Several species are known only by the crania, and in these cases the determination of the genus is to some extent conjectural, since the premaxilla and mandible afford the most striking and reliable generic characters.

A detailed description of the cranial osteology is given, the various genera and species being compared point by point. By the

[1] The investigations of Ruge and Burne forbid our regarding the reduction of this as necessarily indicative of a persistently embryonic state (*cf.* Burne, P. Z. S. 1891, p. 159).

[2] Viz., increase in breadth, with diminution of length and reduction of the ensiform process.

[3] Ray Soc. Monograph on the Development of the Shoulder-girdle and Sternum, pl. xxx. fig. 16.

[4] Osteology of the Mammalia, ed. 3, p. 93, fig. 32.

examination of numerous immature specimens the ossification has been determined, and outline figures are given showing the boundaries of all the bones and their share in the various ridges, processes &c., the special characters of which are of classificatory importance.

Next follows a detailed comparison of the skulls of the Moas with those of the other Ratitæ, this section ending with a summary of cranial characters in the whole subclass.

A table of measurements is then given showing the chief dimensions, in millimetres, of the skull in the more important species of *Dinornithidæ* and in the other genera of Ratitæ. Care is taken to define as exactly as possible the precise way in which the measurements are made. A second table gives the leading measurements expressed as percentages of the length of the basis cranii, a series of indices being thus obtained which are frequently of use in the definition of genera and species.

The author next discusses the bearing of these facts upon the question of the division of the *Dinornithidæ* into genera. He finds that—judging from the skull alone and taking no cognizance of the rest of the skeleton—five genera can be distinguished, viz. *Dinornis*, *Pachyornis*, *Mesopteryx*, *Anomalopteryx*, and *Emeus*[1]. Moreover, *Pachyornis*, *Mesopteryx*, and *Anomalopteryx* are found to present many points of resemblance with one another, of which the most obvious is the narrow, pointed beak. The two broad-beaked genera *Dinornis* and *Emeus*, on the other hand, differ strikingly both from one another and from the narrow-beaked forms. Relying on cranial characters only, the *Dinornithidæ* may therefore be divided into three subfamilies as follows:—

Subfamily *a*. DINORNITHINÆ.
Genus *Dinornis*.

Subfamily *b*. ANOMALOPTERYGINÆ.
Genera *Pachyornis*, *Mesopteryx*, and *Anomalopteryx*.

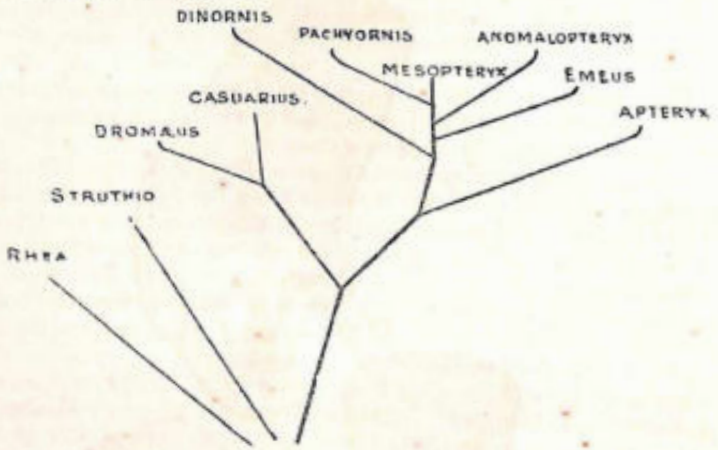
Subfamily *c*. EMEINÆ.
Genus *Emeus*.

This section of the paper ends with a summary of the cranial characters of the subfamilies and genera.

Lastly, the phylogeny of the group is discussed. *Mesopteryx* is considered to be the most generalized form, while *Dinornis* and *Emeus* are both highly specialized but in opposite directions. Of the other Ratitæ, *Apteryx* comes nearest to the Moas in the structure of its skull, and strong affinities are shown by both *Casuarius* and *Dromæus* to the New Zealand genera. *Struthio* and *Rhea*, on the other hand, show no special affinities, as far as the skull is concerned, either to the Australian forms or to one another.

[1] No account is taken of *Megalapteryx*, which is included by Lydekker among the *Dinornithidæ*, as nothing is at present known of its skull.

The author's views as to the phylogeny of the Ratitæ are shown in the following diagram:—



This Memoir will be published entire in the Society's 'Transactions.'

The following papers were read:—

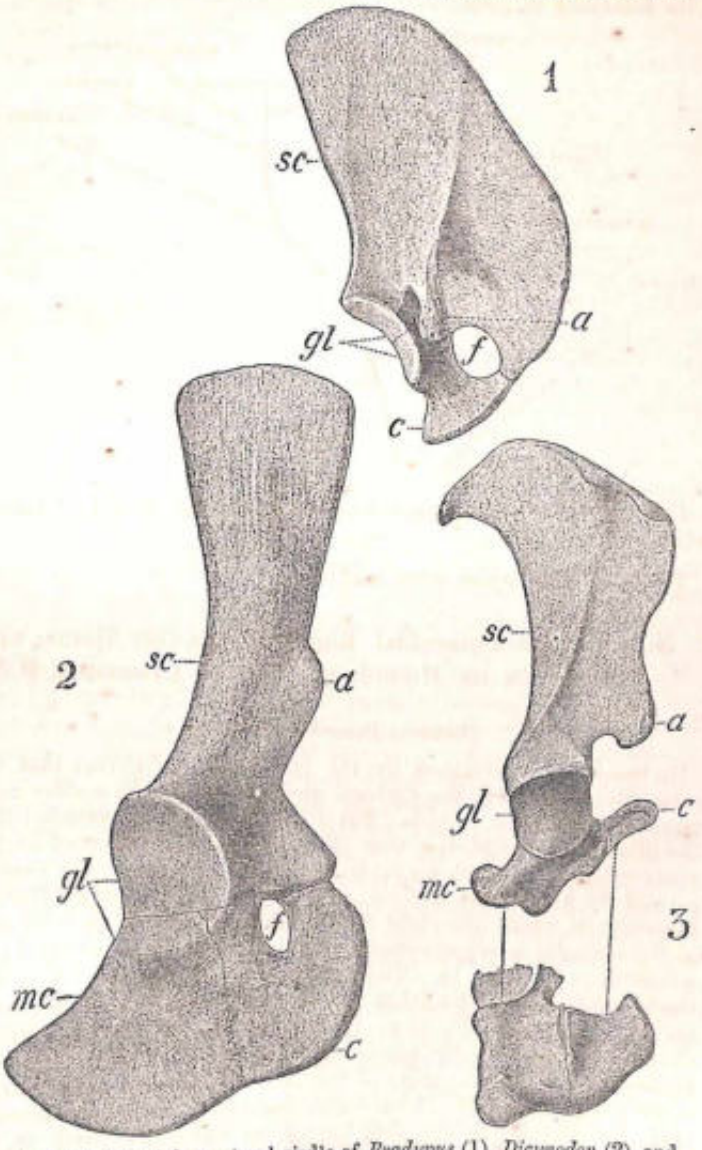
1. Note on the Coracoidal Element in Adult Sloths, with Remarks on its Homology. By R. Lydekker, B.A., F.Z.S.

[Received December 28, 1892.]

It has been ascertained by the late Professor Parker that the coracoidal element in the pectoral girdle of the Sloths ossifies independently from the scapula; but I have not seen it recorded that the division between the two elements can be observed in the adult condition. That such, however, is sometimes the case is proved by a mounted skeleton of *Bradypus* in the Natural History Museum, of which the right half of the pectoral girdle (exclusive of the clavicle) is represented in the drawing now exhibited (see woodcut, p. 173, fig. 1). The suture, although anchylosed, is distinctly visible, and shows that the coracoidal element forms a small moiety of the glenoid cavity; the suture passing from the latter to the upper border of the coraco-scapular foramen, and being continued from the lower edge of the latter to the free lower margin of the compound bone. I have also observed the coracoidal element perfectly distinct in the skeleton of an immature Sloth in the Museum.

The large size and the distinctness of the coracoidal element in the pectoral girdle of the Sloth appear to me to afford considerable support to the view that the Edentates form a group of equal value with the typical Eutheria.

The interest of the specimen does not, however, cease here. If the



The right side of the pectoral girdle of *Bradypus* (1), *Dicynodon* (2), and *Echidna* (3).

sc, scapula; *a*, acromion of do.; *c*, coracoid; *mc*, metacoracoid; *f*, coraco-scapular foramen; *gl*, glenoid cavity.

figure of the pectoral girdle of the Sloth be compared with that of the reptilian *Dicynodon* (fig. 2), it will be apparent that the elements

marked *c* in both are homologous; each articulating with the lower border of the front of the scapula, from which they are partially separated by a foramen (*f*), and each entering into the formation of the glenoid cavity. Now in the Dicynodont the bone marked *c* has usually been identified with the precoracoid. According, however, to Professor Howes[1] the latter term should be restricted to a portion of the clavicular arch, and the name epicoracoid applied to the element under consideration. This emendation, if properly authenticated, I should of course have been willing to accept, had it not been for another consideration. Apart from that consideration, we must call the coracoidal element in the shoulder-girdle of the Sloth the epicoracoid. This is in harmony with the conclusion of Professor Howes, who in the paper cited (p. 404) observes that "the coracoid process of the Marsupialia and Placentalia is the homologue of the Monotreme's epicoracoid." When, however, he proceeds to add that the exclusion of this epicoracoid from the glenoid cavity is one of its most characteristic features, I must take leave to differ from him. It is true that in the Monotremes (as shown in fig. 3 of the drawing) the so-called epicoracoid (*c*)—which all are agreed as representing the epicoracoid of the Dicynodont—is excluded from the glenoid cavity; but this appears to me to be due to its having been pushed forwards and bent downwards into the ventral plane of the body. Both the Dicynodont (in spite of what is urged by Professor Howes) and the Bradypodine so-called epicoracoid enter to a small extent into the formation of the glenoid cavity[2].

We have it, then, that the human coracoid process is homologous with the so-called epicoracoid of *Bradypus*, *Dicynodon*, and *Echidna*; while the element termed coracoid in the two latter, as articulating with the sternum, represents the element so named in the Sauropsida. Here, however, as has been pointed out to me by my friend Mr. Thomas, a new difficulty arises. The coracoid element was first named from the coracoid process of man, and therefore, undoubtedly, the bone which we have called epicoracoid is the true coracoid; while the element to which the latter term is applied in the Monotremes and Sauropsida is properly a metacoracoid. In spite of the difficulty which will probably arise in obtaining the adoption of the latter term for the posterior ventral moiety of the Sauropsidan pectoral girdle, I therefore suggest that we must for the future term that element the metacoracoid, and restrict the term coracoid to the coracoid process of the higher Mammals and the bone which has been termed epicoracoid in Monotremes and Dicynodonts[3].

[1] Journ. Anat. Phys. vol. xxvi. p. 403 (1893).

[2] I may mention that I am indebted to Professor Howes for pointing out that I have incorrectly identified the acromion in the scapula of *Dicynodon*, the true acromion being the one lettered *a* in the accompanying figure.

[3] Professor Howes has been good enough to point out to me that Sabatier has identified a rudiment of the metacoracoid in the human scapula (see Howes, *op. cit.* vol. xxi. p. 190).

2. On the present Range of the European Bison in the Caucasus. By Dr. G. Radde, C.M.Z.S.

[Received January 2, 1893.]

I have just received correct information as to the range of the European Bison (*Bos bonasus*) in the Caucasus. This animal is at present confined to the district around the sources of the Laba and Bjellaja on the north side of the Caucasus, and extends eastwards from the former locality to the springs of the Selentschük. The Bison is scarce everywhere, and generally seen in twos and threes; only once have the tracks of seven together been noticed, though occasionally as many as five have been observed. Evidently the Bison has discontinued its settled habits, and has taken to wandering about in this, its last refuge. Through the ever increasing encroachments of the settlers, and the consequent dispersal of the wild animals, and also, in many places, owing to the new supervision of the forests, the Bison is driven more and more towards the higher ridges of the mountains, and wanders about in the thick forests which border the lower portion of the alpine pasturages.

These forests in the lower lying districts are chiefly composed of *Carpinus betulus* and *Fagus*, above which stand lofty *Abies nordmanniana* and *A. orientalis*; the pine is less plentiful.

The most likely places to find this animal are at present near the sources of the Little Laba, and especially on its western confluent, the Uruschtem. This river is joined by a small stream, the Alaus, in the valley of which the Bison is often met with. It is found from 7000 to 8000 feet above the sea-level. Formerly, 30 or 40 years ago, it was met with much lower down, about 5000 feet, and it was also more common. That the Bison has now passed over the mountain-range and is wandering southwards is pretty certain. There was an instance of this in 1874: in that year an example was killed not far from Romanowskoje, about a day's journey from Sotschi (on the coast); the skin of this animal was sold in Kutais.

Just as the Bison is preserved in the forests of the Government of Grodno[1], so it is under Imperial protection in the Caucasus: the Grand-Duke Michael Nikołajawitsch gave the necessary orders in 1860. Nevertheless it is very difficult to keep guard over these last remaining animals satisfactorily. The whole district in which this animal occurs, and where, in the high mountains, the Chamois and *Capra caucasica* abound, has been for several years rented by the young Grand-Dukes George and Sergius Michaelowitsch: it comprises an area of 477,300 desjatines[2]. In the Staniza of Psebai lives Herr Noska, who performs the functions of Head-keeper. But the task of watching for

[1] See P. Z. S. 1848, p. 16.

[2] A desjatine (Russian measure) = acres. 2 rds. 2 poles. 32

poachers is a very difficult one for him and his mounted under-keepers, and one which has not been attended with much success: one is always hearing the news that individuals of the few remaining herds of the Bison have been killed.

As the extirpation of the Bison here in its last retreat in the Caucasus will undoubtedly soon take place, I had already, nearly 10 years ago, drawn out a plan, which would not only enable me to shoot one or two specimens (♂, ♀), but also to thoroughly describe the animal both externally and internally, and to record everything of anatomical importance by illustration and description. I should also like to add to this an account of its habits, the places it frequents, discuss the hunting of it, and give all available information on the Caucasian Bison. It would likewise be necessary to compare it with a specimen from Grodno. The skeletons and skins should be preserved and mounted. Such a monograph as this would be of great value to the next generation, when the Bison will be numbered with the extinct animals.

To accomplish this thoroughly an anatomist, with a knowledge of the construction of the animal, must come and stay on the spot, as well as a photographer and an artist.

The carrying out of this good idea has unfortunately been put off from year to year; however, it is probable that in 1893 it will be accomplished. It is necessary to be on the spot by the end of August, for in September the animal ascends the mountains to from 7000 to 8000 feet high, and it being very cold then, there would be no fear of the flesh decomposing quickly. The anatomist should remain on the spot until the animal is dissected, and everything measured, noted, figured, and observed. The smaller soft parts could be put in spirit or preserved with salt. When the work has been so far advanced, it would be advisable to make a stay in Psebai with the materials. The rough skeleton and skin could be prepared here and packed ready for transport.

Such an affair as this to be properly managed could *not* be undertaken in Tiflis, but only at St. Petersburg. Here, as in many other things, we are deficient in literature as well as in material for comparison.

All that is known of the Caucasian Bison previous to 1867 will be found recorded in a small work of my late father-in-law, Dr. J. F. Brandt: it was published in Band ii. (Ser. 2) of the 'Verhandlungen der russisch-kaiserlichen mineralogischen Gesellschaft zu St. Petersb.' pp. 101–152, under the heading of "Dombe-Adombe." There is also another article by the same author in the 'Bulletin de la Soc. Imp. d. Nat. de Moscou,' 1866, No. 1, in which he compares, as far as possible, the Caucasian Bison with that of Grodno.

The example of the Bison which is mounted in our Museum was presented in 1868 by Count Sumarakow Elston, at that time Governor of the district of Kuban; there was, however, a young specimen in the Museum in 1867, but this was very much damaged and was disposed of after the reception of the second example. The Tiflis specimen is an old bull; it has a very poor mane and the

beard is short, but the hair on the head and between the horns is thick. There are in the Museum, besides the perfect animal, two imperfect skulls; in one of them the whole forehead and conspicuous frontal bones are missing, and in the other the lower jaw is absent. In the beginning of 1873 a Bison-calf was sent alive from the Caucasus to the Zoological Garden at Moscow, but it soon died. There are also reports of other cases of the capture of Bisons, upon which I can give you no certain particulars; but I have heard that the celebrated hunter Mr. St. George Littledale killed a Bison in 1887 whilst on a hunting expedition, in summer, in the above mentioned-district, in pursuit of *Capra caucasica*[1].

February 28, 1893.

Sir William H. Flower, K.C.B., LL.D., F.R.S., President, in the Chair.

Mr. A. D. Michael, F.Z.S., exhibited specimens of a Tick of the genus *Ixodes*, known locally as the "St. Kitt's" or "Gold Tick," received from Mr. C. A. Barber, of the Agricultural Department, Antigua. These Ticks had become a serious pest in the Leeward Islands, and there was a tradition there that they had been introduced about 30 years ago from St. Kitt's along with some Senegal Cattle. They were unknown in the Leeward Islands up to that date, and were now unknown in St. Kitt's. The specimens had been forwarded to Mr. Michael in order to ascertain whether the species could be identified, and, if so, whether there was any reason to suppose that it was of African origin. Mr. Michael observed that this species was a very well-marked and unmistakable one, described in 1844 by C. L. Koch, of Regensburg, from a male specimen received from Senegal. Koch had named it *Amblyomma venustum*, stating that it was one of the most beautiful of all the Ticks. According to modern classification it would be called *Hyalomma venustum*.

An adult female which Mr. Barber had kept in confinement had laid over 20,000 eggs, most of which were hatched; and Prof. Leidy, in America, had found that adult female Ticks sometimes weighed more than a hundred times as much when fully fed than when fasting.

The following extract from a letter from M. A. Milne-Edwards, F.M.Z.S., to Mr. Sclater, dated Museum d'Histoire Naturelle, Feb. 18, 1893, was read:—

"Vous avez décrit en 1880[2], sous le nom de *Lemur nigerrimus*,

[1] [Two fine specimens (♂ and ♀) of the Caucasian Bison, presented by Mr. Littledale, are to be seen mounted in the gallery of the British Museum.—Ed.]

[2] [See P. Z. S. 1880, p. 451. The specimen in question, purchased Nov. 5, 1878, died June 18, 1882. A similar specimen, received Oct. 16, 1883, died April 4, 1885. Both specimens were sent to M. Milne-Edwards for examination.—Ed.]

une nouvelle espèce de Maki, remarquable par son pélage entièrement noir et l'absence de pinceaux aux oreilles. J'ai pu constater que la femelle du *Lemur nigerrimus* est d'une couleur brune; cette forme a été décrite par Gray en 1871[1] sous le nom de *Prosimia rufipes*. Il est intéressant de retrouver pour cette espèce des différences sexuelles comparables à celles que présente le *L. macaco*, dont le mâle est noir et la femelle brune (*L. leucomystax*). Le couleur des yeux du *Lemur nigerrimus* et de sa femelle *L. rufipes* est caractéristique: au lieu d'être d'un brun-jaunâtre, l'iris est d'un bleu tirant sur le vert. Je vous en envoie un croquis qui intéressera peut-être les membres de la Société Zoologique. Ces Makis viennent du Cap d'Ambre au Nord de Madagascar."

The coloured sketch spoken of in this communication was exhibited.

Mr. Howard Saunders, F.Z.S., exhibited a specimen of the American Stint, *Tringa minutilla*, Vieillot, shot by Mr. Broughton Hawley on 22nd August, 1892, at Northam Burrows, North Devon; being the second example obtained in that locality, and the third that had occurred in England. (*Cf.* 'Zoologist,' 1892, p. 411.)

Mr. Sclater placed on the table for inspection, on behalf of Mr. Richard M. Barrington, the example of the Antarctic Sheathbill killed at Carlingford Lighthouse, Co. Down, on the coast of Ireland, in December last, as recorded by Mr. Barrington (see 'Field,' vol. lxxxi., January 7, 1893, p. 15; 'Zoologist,' vol. xvii. 3rd ser. January 1893, p. 28).

Mr. Sclater observed that from the nearly perfect condition of the wings and tail it was evident that this bird had not been in captivity, or at any rate not within several months from the date preceding that at which it was shot. It was an undoubted example of the Yellow-billed Sheathbill (*Chionis alba*), of which the nearest previously known localities were the Falkland Islands (Abbott, Ibis, 1861, p. 154; Scl. P.Z.S. 1860, p. 386), South Georgia (Pagenstecher, Ber. Nat. Mus. Hamburg, 1884, p. 12), and the adjoining Antarctic Seas (Oustalet, Miss. d. Cap Horn, Zool. vi. p. 288).

As would be seen by reference to the List of Vertebrates, 1883, p. 528, as many as nine specimens of this bird had been exhibited in the Society's Gardens between 1865 and 1882.

The following papers were read:—

[1] Ann. & Mag. Nat. Hist. ser. 4, vii. p. 339.


1. m.1.


2. m.1.


3. m.1.


4. m.2.


5. p.m.


6. m.1.


7. m.1.


8. m.1.


9. m.2.


10. m.2.


11. m.1.


12. p.m.


13. p.m.


14. m.1.


15. m.1.


16. m.1.


17. m.1.


18. m.1.


19. m.1.


20. m.2.


21. m.1.


22. m.1.


23. m.1.


24. m.2.

F.C.&G.M.Woodward del.et lith.

Miocene & recent Sciuridæ.

West, Newman imp.



1a. 1b. 1c.



2.



m_3 m_2 m_1

3.



p_3 m_1 m_2

4.



5.



6.



7.



d_1 m_1 m_2 m_3

10.



m_3 m_2 m_1 p_4

8.



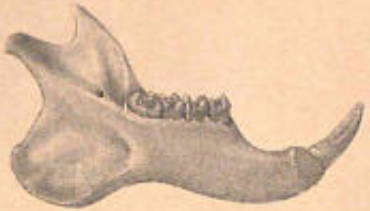
m_3 m_2 m_1 p_3

9.

E.C.&G.M.Woodward del et lith.

West,Newman imp.

Miocene & recent Sciuridæ.



1.



m_2 2.



3.



4.



m_3 m_2 m_1 p_4

5.



m_3 m_2 m_1 d_1

7.



m_3 m_2 m_1 p_4

8.

E.C. & G.M. Woodward del. et lith.

Miocene & recent Sciuridæ.

West, Newman imp.

1. On some Miocene Squirrels, with Remarks on the Dentition and Classification of the *Sciurinæ*. By Dr. C. J. Forsyth Major, C.M.Z.S.

[Received February 14, 1893.]

(Plates VIII.–XI.)

I. Introduction, p. 179.
II. On the Dentition of the *Sciurinæ*, p. 179.
III. Remarks on the Classification of the Sciuridæ, p. 186.
IV. Description of the Fossil Species, p. 190.
V. On the primitive Type of the Sciurine Molar, and of the Eutherian Molar in general, p. 196.
VI. Explanation of the Plates, p. 214.

I. *Introduction.*

In order to determine some remains of Squirrels, collected by myself in the Middle-Miocene deposits of La Grive-Saint-Alban (Isère), it was necessary to compare them with their actual congeners. I have to thank both Dr. A. Günther and Mr. Oldfield Thomas for the kindness shown to me in permitting a close examination of the rich collection of Sciurine skulls in the Zoological Department of the British Museum; and I am besides under great obligations to Mr. Thomas, who is so thoroughly acquainted not only with every species, but indeed with every specimen of the collection under his charge, for having liberally favoured me with his experience and advice, especially in regard to intricate questions of synonymy and specific determination.

The investigation of living forms has led me somewhat farther than I had anticipated; so that before treating of the few fossil remains, it will be necessary to pass in review the numerous, and, in several instances, very unexpected forms of Sciurine dentition, as well as to present some remarks on their classification.

The brachydont teeth of *Sciurinæ* presenting a very primitive type of Rodent molars, I was naturally led to consider them in the light of the prevailing theory, the so-called tritubercularity, the rodent molars having been traced, as those of other orders, to a trituberculate type. This forms the subject of the last part of my communication.

II. *On the Dentition of the* Sciurinæ.

It is a well-known fact that in various families of the Rodentia tubercular molars—which as a rule are brachydont—and laminated molars—which as a rule are hypsodont or rootless—are met with side by side in closely allied genera and in existing species, whilst in some other Orders we have to look among fossils for the more or less brachydont precursors of the living hypsodont forms.

It is equally well known, though not always called to mind,

that the laminated hypsodont molars generally begin tubercular, and the tubercular brachydont molars, when worn, become laminated. For instance: the unworn upper and lower molars of *Castor fiber* show us a somewhat tuberculate crown, in which at first sight it is not easy to recognize the well-known laminated pattern of the worn tooth of the Beaver; likewise, a much-worn molar of the brachydont *Cricetus* presents enamel-folds and islets, though, owing to the shallower and wider valleys, they appear less distinct than in the hypsodont molars, whose valleys are reduced to narrow but deep fissures; so that there is only a gradational difference between tubercular and laminated teeth.

The molar teeth of Sciuridæ are generally represented as tubercular. But, in surveying all the known forms, even restricting ourselves to the subfamily *Sciurinæ*, we meet with all possible intermediate stages between the decidedly hypsodont molars of *Eupetaurus* described by Thomas[1] and the utmost degree of brachydontism as shown by the molars of the Bornean *Rhithrosciurus* or the Myoxine-like teeth of the group of pigmy Squirrels.

First, as to Brachydontism and Hypsodontism.

The species of *Pteromys*, in a restricted sense, are on their way to become hypsodont; they lead over on the one side to *Eupetaurus*, and on the other to the more or less brachydont *Sciuropteri* (including *Pteromys tephromelas*, Günth., and *P. phæomelas*, Günth., whose molars are quite similar to each other and agree more with the *Sciuropteri* than with *Pteromys*).

The African Ground-Squirrels (*Xerus*), as well as the Oriental *Sciurus berdmorei*, Bly., present a curious form of semi-hypsodontism, inasmuch as the internal moiety of the upper and more or less the external moiety of the lower molars are more elevated vertically than the external moiety above and the internal below. Corresponding to the hypsodont part of the molar, we find on the inner side of superior molars a stout and elongate root, on the outer side two smaller and shorter roots.

A small group of Ethiopian Squirrels included in the genus *Sciurus* (*Sc. palliatus*, *cepapi*, *pyrropus*, *congicus*, &c.) present a similar semi-hypsodonty, whilst the Moroccan *Xerus getulus* is in a lesser degree semi-hypsodont.

This greater vertical elevation of the inner side of the crown in superior, and of the outer side in inferior molars, though more evident in semi-hypsodont teeth, is, however, by no means limited to them; we meet with it, although in a lesser degree, in *Sciurus vulgaris* and its allies, and even in the still more brachydont *Rhithrosciurus*. *Ornithorhynchus* itself, as shown by one of the figures published by Stewart[2], has the inner side of the superior teeth more elongate than the outer. This cir-

[1] Oldfield Thomas, "On *Eupetaurus*, a new form of Flying-Squirrel from Kashmir," Journ. As. Soc. Bengal, vol. lvii. ii. no. 3, 1888, pp. 256–260.

[2] Ch. Stewart, "On a specimen of the true teeth of *Ornithorhynchus*," Micr. Journ. vol. xxxiii. n. s. 1891, pl. viii. *i*.

cumstance is of no small importance, as I shall have to point out later on.

The Common Squirrel, and many Oriental members of the genus, as well as some Ethiopian Squirrels (*Sc. rufobrachiatus*, Waterh., *annulatus*, Desm., *shirensis*, Gray, *punctatus*, Temm.), show relatively prominent cusps, and present a transitional stage between semi-hypsodontism and brachydontism. Still more brachydont are two other groups which have little affinity with each other—the African *Sc. stangeri*, Waterh., *Sc. ebii*, Temm., *Sc. aubinnii*, Gr., and the Oriental Giant Squirrels (*Sc. bicolor, indicus, macrurus*, &c.).

The Oriental Pigmy Squirrels (*Sc. exilis*, Müll., *Sc. melanotis*, Müll. & Schl., *Sc. concinnus*, Thos. (Plate X. fig. 10, Plate XI. fig. 7), *Sc. whitehcadi*, Thos.), as well as the pigmy Ethiopian *Sc. minutus*, Du Chaillu (Plate XI. fig. 6), show a low, oval-shaped and nearly horizontal crown, slightly concave in the middle, with transverse ridges. On the whole, their dentition has scarcely anything to do with the Sciuromorphous type of molars, and can only be compared with that of the Myoxidæ, *Eliomys* and *Graphiurus*.

Next we have to consider the pattern of the molars in *Sciurinæ*. The numerous modifications—almost every species presents some peculiarity—may be arranged under three heads:—

1. The first type is represented by the most brachydont forms: some Eocene Squirrels, as *Sc. speciabilis*, Maj., from Egerkingen, the Bornean *Rhithrosciurus* (Plate IX. fig. 2), the Oriental Giant Squirrels (Plates VIII. and IX. fig. 1), the Ethiopian *Sc. stangeri* (Plate VIII. fig. 7, Plate IX. fig. 7) and its allies, *Sc. ebii* and *Sc. aubinnii* (Plates VIII. and IX. fig. 8).

2. The second type is represented by *Sc. vulgaris* and its ally *Sc. syriacus* (I have had no opportunity of examining the dentition of the Japanese *Sc. lis*), by most of the Oriental middle-sized Squirrels (*Sc. prevosti* (Plate VIII. fig. 2), *Sc. lokroides* (Plates VIII. and IX. fig. 3), &c.), by a small Ethiopian group (*Sc. shirensis, Sc. annulatus, Sc. punctatus, Sc. rufobrachiatus*), and by most of the American Squirrels.

3. The third type is represented by several groups of Ethiopian Squirrels: *Xerus* (Plates VIII. and IX. fig. 10), including the Moroccan *X. getulus* (Plates VIII. and IX. fig. 9), by *Sc. cepapi* (Plate VIII. fig. 22, Plate IX. fig. 23), *Sc. palliatus, Sc. pyrropus* (Plate VIII. figs. 15, 23, Plate IX. figs. 15, 22), *Sc. congicus, Sc. lemniscatus, Sc. isabella* (Plates VIII. and IX. fig. 24), *Sc. loehmii*; as well as by some Oriental forms, *Sc. berdmorei* (Plates VIII. and IX. figs. 16–18), Gray's genus *Rhinosciurus* (Plates VIII. and IX. figs. 11, 12), &c.

I do not consider for the present the African and Oriental Pigmy Squirrels, as the characters of their dentition depart entirely from the Sciuromorphan type as a whole.

Brachydontism in itself is quite generally admitted to be the most generalized condition, and the teeth point in the same direction as do those of other Orders, viz., towards a still more primitive type. Besides, we are able to show that the two other

types before mentioned—the *Sciurus vulgaris* and the *Xerus* types, as we may call them—are each of them derived from a brachydont type.

1. Therefore, beginning with the type of the most brachydont Sciurine molar, as being the most generalized, the various forms belonging to it have a very flat elongate crown, the inner and outer sides of which have an almost equal longitudinal extension; and a minimum of transverse arrangement of their cusps, which show a tendency towards a longitudinal disposition.

2. In the upper molars of the *Sc.-vulgaris*-type a transverse arrangement is already conspicuous. The cusps have partly united to form transverse ridges, so that we see here the beginning of a transition from bunodontism into lophodontism: four more or less transverse ridges, the two median being the stoutest, with three intervening valleys. On the outer side are three prominent cusps, corresponding to the three anterior ridges. A characteristic feature on the inner side of the upper molars is an apparently single cusp, which fits into the cup- or basin-shaped hollow of the inferior molar, somewhat like a pestle in a mortar. In examining, however, quite unworn teeth (of *Sc. vulgaris*, e. g.), the inner side of the upper molar presents itself more elongate and shows a tripartite division, the median cusp being the stoutest. Still more is this seen in the upper molars of most of the middle-sized Oriental Squirrels, which in other characters (of the skull &c.) as well as in the dentition approach *Sc. vulgaris*. The molars, however, are somewhat stouter, and the cusps and ridges more prominent. In unworn teeth of Oriental forms, *e. g.* of *Sc. prevosti* (Plate VIII. fig. 2) or *Sc. lokroides* (Plate VIII. fig. 3), the inner margin is rather elongate, and shows more distinctly than does *Sc. vulgaris* the tripartite division with a prominent medial cusp. When the teeth have become somewhat worn, these divisions tend to disappear; so that the usual aspect of worn upper teeth in these Oriental Squirrels is that presented by the somewhat worn teeth of *Sc. vulgaris*, viz., a single broad internal cusp. The shortening, or, as one might say, the reduction and simplification of the inner side of the upper molars compared to the outer side (and, as may be added, of the outer side of inferior molars compared to their inner side) appears to be a general and primitive tendency of molar teeth; in fact, we meet with it already among Cretaceous Mammalia, as well as in the recent *Ornithorhynchus*. As to its meaning, we shall have to consider it afterwards.

In lower molars of the *Sciurus-vulgaris*-type, two cusps, the antero-external and the antero-internal, show a tendency to unite transversely. Anteriorly to these we have a small transverse valley, bordered in front by a transverse ridge, which is more rarely (*Sc. palmarum*) raised in two cusps. In the premolar there is generally one cusp only in front.

The hinder part of inferior molars is shaped into a sort of cup, to receive, as above mentioned, the internal tubercle of the upper

molars. This is a common form of inferior sciuromorph molar, as we meet with it, not only amongst most of the species of *Sciurus*, but as well in *Tamias*, *Spermophilus*, and *Arctomys*. The cup is bordered by the two anterior cusps, by two posterior cusps, of which the internal is generally less developed or suppressed, by a posterior heel, and sometimes by two secondary cusps between the two pairs of principal cusps. Sometimes the basin-shaped appearance becomes more evident still by the coalescing of all these cusps, so that already in quite unworn teeth, *e. g.* of the interesting *Sc. everetti*, Thomas (Plate IX. fig. 4), the rounded margin of the basin appears perfectly even.

In the *Sciurus-vulgaris*-type, the upper molars also present a sort of basin, in order to receive the postero-external cusp of the lower molars. This is the median valley, closed internally by the largely developed internal cusp, and whose formation appears to be due to the partial atrophy of a transverse series of cusps, there having remained only the internal one greatly developed, and often, as in *Sc. vulgaris*, a very small median cusp on the outer side. In the *Xerus*-type, to be mentioned hereafter, we frequently have the space of this median valley occupied by a transverse ridge, which brings up to five the number of these transverse ridges in the upper molars, with, between them, four narrow transverse depressions instead of three, as is generally the case.

The *Sciuropteri* come near to the same type, presenting on the whole a transitional stage between bunodontism and lophodontism, with the cup-like shape of lower molars, to which corresponds the formation of a median valley in the upper molars. In these last we find, moreover, the anterior valley of the crown more fully developed, than is the case in the members of the *Sciurus-vulgaris*-type, and thus the molars of *Sciuropteri* often present a more elongate form. A characteristic feature of Sciuropterine molars is a delicate wrinkling of the enamel of the valleys, and this, according to the different species, extends more or less to the cusps or crests, which thus appear crenate.

Lower basin-shaped molars are met with as far back as the Cernaysian fauna of Reims, the lowest known Eocene deposit in Europe [1]. This is one of the reasons which makes me agree with Schlosser [2] in considering the fossils (*Plesiadapis* and *Protoadapis*), described as Lemurids, to be Rodentia. The same conclusions, and for the same reason, apply to *Plesiesthonyx* from the "Faune Agénienne" of Reims [3], and to some specimens from the Eocene of Egerkingen, doubtfully referred by Rütimeyer to *Plesiadapis* [4].

[1] Lemoine, "Etude d'ensemble sur les dents des Mammifères fossiles des environs de Reims," Bull. Soc. géol. de France, t. xix. 1891, pl. x. figs. 64–68, 76–78.

[2] M. Schlosser, "Ueber die systematische Stellung der Gattungen *Plesiadapis*, *Protoadapis*, *Pleuraspidotherium*, and *Orthaspidotherium*," Neu. Jahrb. für Mineralogie, Geologie und Palæontologie, 1892, Bd. ii. pp. 238–240.

[3] Lemoine, *l. c.* pl. x. fig. 32.

[4] L. Rütimeyer, "Die Eocäne Säugethierwelt von Egerkingen," Abh. d. schweiz. paläontol. Ges. vol. xviii. 1891, pp. 121–125, pl. viii. figs. 16, 17.

3. To the *Xerus*-type belong most of the semi-hypsodont Sciurine teeth of the groups already mentioned. It is distinguished from the *Sciurus-vulgaris*-type by a more complete lophodontism, the crests running in a transverse direction, and the valleys being reduced to narrow but deep fissures. The main difference from Ungulate lophodont molars consists in their having not two, but four or even five crests, the anterior and posterior margin of the molar being as much or almost as much raised as the two medial crests. So that the *Xerus*-type presents in upper as well as in lower molars three transverse depressions or fissure-like valleys (and four in superior molars where there are five crests). This type forms on the whole a very striking approach to the hystricomorphan molar.

Twenty years ago I pointed out that two African Squirrels, *Sc. congicus* and *Sc. leucostigma* (this last being now considered as a variety of *Sc. pyrropus*), approach the Hystricomorpha in a further development of the characters in which the Ethiopian *Xerus* departs from the *Sciurus-vulgaris*-type. Again, the Eocene *Sciuroides* was shown to resemble in its molars those of the Hystricomorpha *Cercolabes* and *Erethizon*, whilst, on the other hand, the Eocene hystricomorphan *Trechomys* was shown to approach *Sciuroides* [1].

Twelve years later, Schlosser, working on fossil forms, with much richer material at his command, confirmed these observations, showing that a group of Tertiary Rodentia showed characters intermediate between the Sciuromorpha and Hystricomorpha [2].

It is of no little interest that actually living Sciuromorpha show in their dentition, as well as in the characters of their skull, that the distinction between Sciuromorpha and Hystricomorpha is less sharp than is generally admitted. Schlosser seems not to have examined any recent Ethiopian Squirrels, as he does not mention the important characters they present. Nor has any other author, with the exception of Alph. Milne-Edwards, who incidentally mentions *Sciurus pyrropus*, F. Cuv., saying that "les molaires offrent une apparence toute particulière, due à l'existence de replis d'émail qui s'enfoncent profondément dans la dentine, constituant ainsi de véritables rubans. Je ne connais que cette espèce sur laquelle on observe ces particularités; cependant, chez certains *Xerus*, on en voit des indications" [3].

The fact is that the majority of Ethiopian Squirrels depart from the Sciurine type both in their superior and inferior molars, approaching towards hystricine lophodonty by the uniting of their cusps in a transverse direction, so that the characteristic cup-like

[1] C. J. Forsyth Major, "Nagerüberreste aus Bohnerzen Süddeutschlands und der Schweiz. Nebst Beiträgen zu einer vergleichenden Odontographie von Ungulaten und Unguiculaten," Palæontographica, Bd. xxii. 1873, pp. 75–130.

[2] Max Schlosser, "Die Nager des Europäischen Tertiärs etc.," Palæontographica, xxxi. 1885, pp. 19–162.

[3] H. et Alph. Milne-Edwards, "Recherches pour servir à l'Histoire Naturelle des Mammifères, etc." (Paris, 1868–1874), p. 166.

shape of inferior molars tends to disappear. The species which present in a greater or lesser degree this conformation are, besides *Xerus* (Plates VIII. and IX. fig. 10), including *X. getulus*, Gesn. (Plates VIII. and IX. fig. 9), *Sc. palliatus*, Pet., *Sc. cepapi*, Smith (Plate VIII. fig. 22, Plate IX. fig. 23), *Sc. pyrropus*, F. Cuv. (Plate VIII. figs. 15, 23, Plate IX. figs. 15, 22), *Sc. congicus*, Kuhl, *Sc. lemniscatus*, Le Conte, *Sc. isabella*, Gr. (Plates VIII. and IX. fig. 24), and *Sc. bochmi*, Reich. At the same time they present in their skull some resemblance to the Hystricomorpha. They also approach *Anomalurus* (Plates VIII. and IX. figs. 13, 14), the various hystricomorphine characters of which have long ago been noted, but have, I think, rather been underrated by Alston[1].

It thus would appear that we have here a group of Sciuromorpha, somewhat specialized in the direction of Hystricomorpha, as we find, too, in several Eocene Rodentia.

But this is not all. The molars of *Sc. berdmorei*, Bly. (Plates VIII. and IX. figs. 16–18), an Oriental Squirrel, and those of the Bornean "*Rhinosciurus*, Gr." (Plates VIII. and IX. figs. 11, 12), agree with those of *Xerus* and the above-named Ethiopian Squirrels, not only in their semi-hypsodontism, but likewise in their lophodontism, whilst the less semi-hypsodont Oriental *Sc. tristriatus*, Waterh., and *Sc. palmarum*, L., tend to connect the *Xerus*-type with the *Sc.-vulgaris*-type, in approaching the form of molar of most of the "middle-sized" Oriental Squirrels. Two other Oriental species, *Sc. insignis*, F. Cuv. (Plates VIII. and IX. fig. 6), and *Sc. hosei*, Thos.[2] (Plates VIII. and IX. fig. 5), from Borneo, though semi-hypsodont, and in other characters agreeing with the members of the *Xerus*-group, show a remarkable modification in the pattern of the molars, the valleys being reduced to mere superficial cracks, which disappear very early by wear. I think that we have in the molars of these two forms examples of that kind of retrogressive evolution of the molars to which attention has been lately drawn in an important paper by Leche[3], who attributes it to the modification of food. The *Macroglossi*, *Pteropus scapulatus*, and the *Epomophori*, differing in this respect from other *Pteropi*, feed on juicy fruits, whose contents need not be chewed. Likewise *Chiromys madagascariensis*, the molars of which present a similar kind of retrogressive evolution, is known to feed principally on succulent juices, especially of the sugar-cane, as well as on wood-boring caterpillars. It now is very suggestive that *Sciurus insignis*, according to Müller and Schlegel[4], is especially fond of juicy and aromatic fruits of different species

[1] Edward R. Alston, "On *Anomalurus*, its structure and position" (Proc. Zool. Soc. 1875, p. 94).

[2] Ann. Mag. Nat. Hist. for Sept. 1892, pp. 215, 216.

[3] W. Leche, "Studien über die Entwicklung des Zahnsystems bei den Säugethieren," Morpholog. Jahrbuch, xix. 1892, pp. 543, 544.

[4] Sal. Müller & Herm. Schlegel, "Over de tot heden bekende Eekhorens (*Sciurus*) van den Indischen Archipel," Verhandelingen over de Natuurlijke Geschiedenis der Nederlandsche overzeesche Bezittingen," Leiden, 1839–44, p. 99.

of *Elettaria* (*E. mollis*, *speciosa*, and *coccinea*), as well as of some kinds of beetles and all sorts of caterpillars. A very similar food will in all likelihood hereafter prove to be preferred by *Sc. hosei*[1].

The molars of the semi-hypsodont *Pteromys* (Plates VIII. and IX. fig. 19) bear the same relation to those of *Sciuropterus* as the molars of the *Xerus*-type do to those of the *Sciurus-vulgaris*-type. In both, the valleys appear deepened and narrowed, but in *Pteromys* the narrowing is effected by the vertical increase of the wrinkles referred to in *Sciuropterus* molars (Plates VIII. and IX. figs. 20, 21, Plate IX. figs. 2, 5),—the result of which is that the cup of an inferior molar is filled up by these ramifications of the enamel, and the crown of both upper and lower molars becomes almost plane. The Eocene *Ailuravus* from Egerkingen (Switzerland)[2], which I consider to be a Rodent, is in this respect somewhat intermediate between *Pteromys* and *Sciuropterus*.

I have called the *Xerus*-type of molar a somewhat specialized one, and am justified in doing so, as the teeth presenting it are no more brachydont—brachydontism being the primitive condition. The brachydont crown of Sciuromorpha is at the same time bunodont; whereas the semi-hypsodont teeth are more or less, and the hypsodont teeth are completely, lophodont.

Another small group of Ethiopian Squirrels—*Sc. stangeri* (Plates VIII. and IX. fig. 7), *Sc. ebii*, and *Sc. aubinnii* (Plates VIII. and IX. fig. 8)—deserves the name of brachydont *Xeri*, as it shows from what form of brachydont molar the *Xerus*-type may have originated. Other characters of this same small group to be mentioned presently likewise point towards the Hystricomorpha, notwithstanding their perfect brachydontism.

In concluding these general remarks on the form of the Sciurine molar, I repeat what has already been stated, viz., that in perfectly brachydont Sciurine teeth the cusps tend towards a longitudinal arrangement—two marginal series in the lower molars; two marginal and one or more, more or less complete, intermediate series in the upper molars. This circumstance is of importance, as pointing towards the primitive arrangement of the molar cusps, and we shall have to revert to it when treating of the original type of molar.

III. *Remarks on the Classification of the* Sciuridæ.

We have now to consider some of the bearings of the foregoing remarks on Sciurine molars on Classification.

Classification was not my original purpose; but some of the results arrived at seem to me of some interest in this respect too, so that I think they may be worth mentioning. Nor do I see why

[1] Mr. Hose informs me that *Sc. hosei* is a ground-squirrel like *Sc. insignis*; this fact goes far to strengthen the supposition that the food of both is similar.

[2] L. Rütimeyer, *l. c.* pl. vii. figs. 18, 19.

systematic Zoology should not take into consideration, more than has been the case hitherto, the characters of the skull and dentition of Sciuromorpha, which characters have been of such excellent service for Myomorpha.

My arrangement of the Sciuridæ (see the table, p. 189) contains three subfamilies:—

1. *Sciurinæ*, including the genera of the subfamily *Sciurinæ* of authors (with the exception of the Flying-Squirrels and some pigmy forms), as well as the members of the subfamily *Arctomyinæ* (*Cynomys*, *Arctomys*, *Spermophilus*).
2. *Pteromyinæ*, including all the Flying-Squirrels (*Sciuropterus*, *Pteromys*, *Eupetaurus*).
3. *Nannosciurinæ*, the Oriental Pigmy Squirrels *Sc. exilis*, S. Müll., *Sc. melanotis*, Müll. & Schleg., *Sc. concinnus*, Thos.[1], *Sc. whiteheadi*, Thos.[2], as well as the Ethiopian Pigmy Squirrel, *Sc. minutus*, Du Chaillu.

I shall say a few words on the *Pteromyinæ* when dealing with the fossil forms.

As to my subfamily *Sciurinæ*, the inclusion of the *Arctomyinæ* in the subfamily *Sciurinæ*, which appears at first sight to be a radical change, will, I am sure, meet with the least opposition. The close relationships of *Spermophilus* to *Tamias* and *Sciurus* are generally recognized; and my scheme is further justified by the consideration that several North-American species of the heterogeneous genus *Spermophilus* show in their skull and dentition a striking analogy with *Xerus*, a circumstance which has been generally overlooked. Besides, the dentition of the *Arctomyinæ* is so decidedly Sciurine that I do not see why we should any longer keep *Arctomys* and *Spermophilus* artificially separated from *Xerus* and *Sciurus*, for no other reason than convenience.

As to the minor divisions, it results from the preceding remarks on the dentition of *Sciurinæ* that the Ethiopian *Xerus* occupies, with its three species, a much less isolated position than has hitherto been admitted, inasmuch as numerous species of Ethiopian Squirrels, as well as some Oriental forms, included in the genus *Sciurus*, have close relations to *Xerus* in characters, which at the same time approach it to the Hystricomorpha. The characters of the skull of *Xerus* and its congeners point in the same direction, and consist, to express it briefly, in the elongate form of the cranium in general and the frontals particularly, coupled with the shortening of the postorbital processes; whereas the remnant of *Sciurinæ* are, on the contrary, characteristic for their broad frontals and the long postorbital processes. Moreover, a small group of Ethiopian Squirrels, related to *Xerus* (*Sc. stangeri*, *Sc. ebii*, *Sc.*

[1] Ann. Mag. Nat. Hist., Nov. 1888, pp. 407, 408. *Hab.* Isabella, Basilan, Philippines.

[2] Ann. Mag. Nat. Hist. (5) 1887, xx. p. 127; P. Z. S. 1889, p. 231. *Hab.* Borneo.

aubinnii), presents a closer approximation towards the hystricine type in the relatively large infraorbital opening [1].

Again, another group of Ethiopian Squirrels (*Sc. rufobrachiatus*, *Sc. annulatus*, *Sc. punctatus*, *Sc. shirensis*), belonging to the *Sciurus-vulgaris*-type by the characters of their dentition, show in the conformation of their skull some approach towards *Xerus*; whilst, on the other hand, a few species, which from the form of their skull cannot be separated from the *Xerus*-group, tend by the characters of their molars somewhat towards the *Sciurus-vulgaris*-type, as, for example, amongst Oriental Squirrels the *Sc. tristriatus* and *Sc. palmarum*.

If we try to express by a systematic arrangement these various relations, two courses appear open to us: either to unite *Xerus* with *Sciurus*, or to create separate genera for those groups of species which depart from *Sciurus* in approaching *Xerus*. However, neither of these two suggestions seems satisfactory. By uniting *Xerus* with *Sciurus* this last genus would become still more heterogeneous than it is already—*Xerus*, sensu stricto, having besides near relationships with *Spermophilus*. By splitting up *Sciurus* in various genera, the relationships of these last to *Xerus* would not be seen in their true light. So that it appeared to me more rational to adopt a middle course, viz., to detach from *Sciurus* a certain number of species, which in their skull and dentition show Xeroine affinities, and to unite them with *Xerus*, which last genus would thus become composed of five subgenera (see the table on the opposite page).

The genus *Sciurus*, distinguished from *Xerus* by characters of the skull as well as of the dentition, is divided into three subgenera, each of which is characterized by cranial and dental peculiarities.

Subgen. *a*, *Eosciurus*, contains the Oriental Giant Squirrels, which by all authors on the subject, with the exception of Anderson, have been recognized to be a distinct group; in 1842 P. Gervais [2] pointed out the characters of the skull. As I have already stated more than once, the molars are perfectly brachydont, with delicate rugosities of the enamel-covering. Only one superior premolar.

In the subgenus *b. Sciurus* we have four divisions:—(α) A small group of Ethiopian Squirrels, characterized by the absence of the minute superior premolar, and, as a compensation, a very elongate posterior premolar. On the rest, the dentition is similar to that of *Sciurus vulgaris*. I have before described the slight differences in the molar pattern of division β, containing the majority of so-called

[1] Their skull in general, and most of all that of *Sc. ebii*, is so strikingly *Xerus*-like, with the only exception of the jugalia not being depressed, that it seems not possible to maintain them in the genus *Sciurus* if *Xerus* be maintained as such.

[2] P. Gervais, "Description de l'Ecureuil Delessert, accompagnée de quelques remarques sur la famille des Rongeurs sciuriens," Magasin de Zoologie, 2. iv. 1842, p. 4.

Fam. SCIURIDÆ.

I. Subfam. SCIURINÆ.

1. Genus Rhithrosciurus.
   Rh. macrotis, Gr.
2. Genus Xerus.
   a. Subgen. *Protoxerus.*
   X. stangeri, Waterh.; *X. cbii*, Temm.; *X. aubinnii*, Gr.
   b. Subgen. *Xerus.*
   X. rutilus, Cretzschm.; *X. erythopus*, Ét. Geoffr.; *X. capensis*, Kerr.
   c. Subgen. *Atlantoxerus.*
   X. getulus (Gesn.).
   d. Subgen. *Paraxerus.*
   X. cepapi, Smith; *X. palliatus*, Pet.; *X. pyrropus*, F. Cuv.; *X. congicus*, Kuhl; *X. lemniscatus*, Le Conte; *X. isabella*, Gr.; *X. boehmi*, Reich.
   e. Subgen. *Euxerus.*
   X. (*Rhinosciurus*) *laticaudatus*, Müll. & Schl.; *X. berdmorei*, Bly.; *X. tristriatus*, Charlesw.; *X. palmarum*, L.; *X. insignis*, Desm.; *X. hosei*, Thos.
3. Genus Sciurus.
   a. Subgen. *Exosciurus.*
   Sc. indicus, Erxl.; *Sc. bicolor*, Sparrm.; *Sc. albiceps*, Desm.; *Sc. macrurus*, Penn.
   b. Subgen. *Sciurus.*
   α. Sc. rufobrachiatus, Waterh.; *Sc. shirensis*, Gr.; *Sc. annulatus*, Desm.; *Sc. punctatus*, Temm.
   β. Sc. erythraeus, Pall.; *Sc. brookei*, Thos.; *Sc. tenuis*, Horsf.; *Sc. atrodorsalis*, Gr.; *Sc. rosenbergi*, Jent.; *Sc. caniceps*, Gr.; *Sc. ferrugineus*, F. Cuv.; *Sc. lokroides*, Hodgs.; *Sc. prevosti*, Desm.; *Sc. steerei*, Günth.; *Sc. jentinki*, Thos.; *Sc. notatus*, Bodd.; *Sc. everetti*, Thos., &c.
   γ. Sc. vulgaris, L.; *Sc. syriacus*, Ehr.
   δ. Sc. carolinensis, Gmel.; *Sc. griseoflavus*, Gr.; *Sc. griseogenys*, Gr.; *Sc. aestuans*, L.; *Sc. deppei*, Pet.; *Sc. aberti*, Woodh., &c.
   c. Subgen. *Tamias.*
4. Genus Spermophilus.
5. Genus Arctomys.
6. Genus Cynomys.

II. Subfam. PTEROMYINÆ.

1. Genus Sciuropterus.
2. Genus Pteromys.
3. Genus Eupetaurus.

III. Subfam. NANNOSCIURINÆ.

1. Genus Nannosciurus.
   N. exilis, S. Müll.; *N. melanotis*, S. Müll. & Schleg.; *N. concinnus*, Thos.; *N. whitcheadi*, Thos.; *N. minutus*, Du Chaillu.

"middle-sized" Oriental Squirrels. Division γ, with *Sc. vulgaris* and *Sc. syriacus*, distinguished from each other by slight characters of the first superior premolar (p^1). Division δ contains most of the American Squirrels.

The third subgenus *c.* is *Tamias*, which I cannot separate from the genus *Sciurus*.

The skull of the Pigmy Squirrels is very remarkable, a fact to which attention has been drawn by Müller and Schlegel, as well as by O. Thomas. The anterior zygomatic root is a perfectly vertical narrow septum, and is placed so much backwards (above the second molar) that the facial part of the cranium appears very elongate, whilst the frontal region is broader relatively than in any other Sciuromorpha. The orbita is formed by an almost circular bony ring.

The dentition, of which I give the figures (Plate X. fig. 10, Plate XI. figs. 6, 7) is unique amongst Sciuromorpha, and can, as I have said before, be compared only with that of some *Myoxi*. In the upper jaw there are either one or two premolars, and one in the lower jaw. The posterior upper premolar (p^1) and the lower premolar (p_1) are of minute size as compared to the homologous teeth in other Sciuromorpha, sometimes scarcely one-third of the size of the molars. This is another feature they have in common with certain of the *Myoxi*. The pattern of the crown differs from that found in the Sciuromorpha generally, in presenting only three complete transverse crests in the upper molars instead of four, and three in the lower molars. The third crest, counting from front to back, of Sciuromorphous molars is very reduced in these pigmy Squirrels, sometimes scarcely more than a minute cusp. A further peculiarity of these molars is the large development of the anterior transverse valley of both superior and inferior molars, as compared to the usual Sciuromorphous type, sometimes almost equalling that of the posterior valley. This last, owing to the partial suppression of the third crest (Rütimeyer's *Nachjoch*), occupies the area of the median as well as that of the posterior transverse valley in the tooth of Sciuromorpha.

These characters of the teeth and the skull of the Pigmy Squirrels sufficiently justify the creation of a separate subfamily for them.

IV. *Description of the Fossil Species.*

The remains of two species of Squirrels are representatives, the one (1) *Sciurus spermophilinus*, Dep.[1], of the *Sciurus vulgaris*-type, the other (2) *Xerus grivensis*, n. sp., of the *Xerus*-type, which both types have been so fully discussed before, that I need scarcely enter into further details.

[1] Ch. Depéret, "Recherches sur la succession des Faunes de Vertébrés miocènes de la Vallée du Rhône," Arch. du Mus. d'Hist. Nat. de Lyon, t. v. (Lyon, 1887), pp. 108–110, pl. xiii. figs. 14, 14 *a*.
Id., "La Faune de Mammifères miocènes de la Grive-Saint-Alban (Isère), etc.," Arch. Mus. d'Hist. Nat. de Lyon, t. v. (Lyon, 1892), pp. 48–50, pl. i. figs. 26–27.

Sc. spermophilinus is represented by a fragment of the left maxilla (Plate X. fig. 4), carrying the posterior premolar and the two anterior molars, and by several mandibular rami (Plate X. figs. 6–9). A minute alveolus for p_2 is visible in front of the posterior upper premolar. The inferior molars show the cup- or basin-shaped conformation, the cusps being arranged laterally.

Depéret is of opinion that the molars of *Sc. spermophilinus* differ from *Sc. vulgaris* only in small particulars. I find more resemblance to some Oriental members of the subgenus *Sciurus*; the antero-internal cusp of the lower molars being extremely elevated, whilst the postero-internal cusp is almost suppressed (Plate X. fig. 9). We meet with exactly the same pattern in the Oriental *Sc. atrodorsalis*, Gr., *Sc. rosenbergi*, Jent., *Sc. caniceps*, Gr., *Sc. brookei*, Thos., and others. The third lower molar is more elongate than in *Sc. vulgaris*; this, too, is a character of the Oriental group of Squirrels mentioned. Besides, both upper and lower incisors are vertically striated by ridges (Plate X. fig. 5). Amongst recent *Sciurinæ*, only *Rhithrosciurus*, whose molars, however, are very different from those of the fossil, presents this character. It occurs also on lower incisors of some species of *Sciuroides* from Cailux, in the British Museum. As the same striation of incisors is found in the Tillodont *Calamodon* of the Lower American[1] and Swiss[2] Eocene, it may prove to be an inherited character.

Length of m_3, m_1, p_1 sup., 6 millim.; length of m_3, m_2, m_1, p. inf., 7·5 millim.

Xerus grivensis, n. sp. (Plate X. figs. 2, 3).—A left mandibular ramus, showing the three molars and the alveolus of the premolar. Length of the three molars 6 millim. Incisor without vertical ridges. The molars present a more advanced stage of lophodontism than those of *Sc. spermophilinus*, not only the anterior cusps uniting transversely, but the postero-external and postero-internal cusp—the latter more fully developed than in *Sc. spermophilinus*—showing the same tendency. So that we have three, instead of two, transverse valleys, the median and posterior valley being incompletely divided. I could not better characterize the molars of this fossil than by calling them a minute and somewhat less semi-hypsodont form of *X. berdmorei*, Bly., from Martaban, Tenasserim, Cambodja, and Cochin-China.

Sciuropterus albanensis, n. sp.—The third fossil, a left ramus of the lower jaw (Plate X. fig. 1, Plate XI. figs. 3–5), is strikingly similar in the character of the molars and the ramus to some of the larger species of *Sciuropterus*, and especially to *Pteromys tephromelas*, Günth.[3] (Plate XI. figs. 1, 2), and *Pter. phæomelas*, Günth.,

[1] E. D. Cope, "The Vertebrata of the Tertiary Formations of the West," Book I. 1883 (Rep. Un. States Geol. Surv. of the Territ. vol. iii., Washington, 1884) pp. 188–192, pl. xxiv. c. fig. 1 *b*.

[2] L. Rütimeyer, "Die Eocäne Säugethierwelt von Egerkingen" (Zürich, 1891), pl. viii. figs. 25–27, p. 126.

[3] Proc. Zool. Soc. Lond. 1873, p. 413, 1886, p. 53.

from the Malay region and Borneo, which are both, from the conformation of their molars, not to be distinguished from *Sciuropteri*. I present an enlarged sketch of the fossil molars, together with the first molar of *Sc. tephromelas*. The few small differences shown by the comparison of the fossil with the recent species consist in a somewhat larger development of the anterior valley, and some minor details in the rugosities of the enamel. The cusps also, bordering the basin-shaped crown, are somewhat stouter in the fossil.

Length of the four grinders:—m_3 4, m_2 3·5, m_1 3, p_3 2·5 millim.

This is the first fossil of *Sciuropterus* recorded. However, I am of opinion that *Sciurus sansaniensis*, Lart., from the Middle Miocene of Sansan, is but a smaller species of *Sciuropterus*, judging, at least, from an enlarged figure of a molar published by Filhol [1].

Depéret has described and figured as a species of *Sciuroides* an inferior molar from the Lower Pliocene of Roussillon [2], which so much agrees with the homologous molar in some *Sciuropteri* (cf. *Sc. volans*), that I think I am right in considering the Roussillon tooth a third fossil form of *Sciuropterus*.

But this is not all: under the name of *Allomys* (*Meniscomys*), Marsh [3] and Cope [4] have made known remains of Rodentia from the Miocene of Oregon. Marsh considers them as "probably related to the Flying-Squirrels," adding that the teeth are somewhat like those of Ungulates.

Cope states [5] that "the characters of the dentition of this genus (i. e. *Meniscomys*) resemble those of the genus *Pteromys*."

The figures given by Cope are insufficient for close comparison, as has already been pointed out by Schlosser: but it would appear from the description that one of the species, *M. cavatus*, approaches *Sciuropterus* and especially *Sc. pearsoni*. The crowns of the inferior molars are described as basin-shaped; "and although the enamel is wrinkled in a complicated manner, the wrinkles are not elevated as in the other species of the genus. Thus the inferior molars more nearly resemble those of ordinary *Sciuridæ* than do those of the other species of *Meniscomys*" [6]. In the characters mentioned, these other species would form some approach to *Pteromys*.

When comparing the upper teeth of his *Allomys nitens* with those of Ungulates, Marsh doubtless refers to the angulate conformation

[1] H. Filhol, 'Etudes sur les Mammifères fossiles de Sansan' (Paris, 1891), pp. 36, 37, pl. i. fig. 3.

[2] Ch. Depéret, "Les animaux pliocènes de Roussillon," Mém. Soc. Géol. de France, Paléontologie, t. i. (Paris, 1890). p. 49, pl. vii. figs. 39, 39 *a*, t. iii. 1892, p. 121, pl. xii. fig. 14. (The text quoted in the last instance refers to an upper molar figured, but there is no fig. 14 on pl. xii.)

[3] O. C. Marsh, "Notice of some new Vertebrate Fossils" (Amer. Journ. of Science and Arts, vol. xiv. 1877, p. 253).

[4] E. D. Cope, "The Vertebrata of the Tertiary Formations of the West," Book I. 1883 (Rep. Un. States Geol. Survey of the Territ. vol. iii., Washington, 1884).

[5] *L. c.* p. 827.

[6] *L. c.* p. 831.

of the outer cusps. A similar shape is shown by the outer cusps of *Sciuropterus pearsoni*, and by those of *Pseudosciurus*, which I have long ago[1] described at length, in drawing the attention to their various analogies with Ungulates. These analogies are so deceiving, that the discoverer of *Pseudosciurus*, having but isolated teeth at his command, considered them to be from an Ungulate.

Two lower molars of a Rodent from the Phosphorites of Mouillac have been described by Schlosser under the name of *Sciurodon*[2]. He compares them with *Pteromys*, and suggests that they are nearly related to, and perhaps identical with, the Oregon *Meniscomys*[3].

In the British Museum are preserved several unpublished isolated molars of a minute-sized Rodent from the Oligocene Bembridge Limestone of the Isle of Wight, some of which, likewise, can only be approximated to *Sciuropterus* or a nearly related genus. Similar remarks apply to a molar from the Swiss Eocene of Egerkingen, lately published by Rütimeyer under the name of *Ailuravus*[4], which, however, is undoubtedly a lower molar of a Rodent, and agrees most with those of the larger species of *Sciuropterus*, although, as stated above, it is somewhat intermediate between *Pteromys* and *Sciuropterus*. *Ailuravus* having relations to one of the species of *Plesiadapis* (*Pl. gervaisii*, Lem.), from the Lower Eocene of Reims[5], it results that *Sciuropterus*-like Rodentia were very abundantly represented and widely spread during the Tertiary.

I shall hereafter point out more fully the resemblance between two recent species of *Sciuropteri*, *Sc. horsfieldi* and *Sc. pearsoni*, with the two Eocene genera *Sciuroides* and *Pseudosciurus*.

After this brief reference to fossils showing close analogy with recent Flying-Squirrels, it remains for me to justify my arranging these last in a distinct subfamily, the *Pteromyinæ*.

Taking the genus *Pteromys* in a restricted sense, it is a very homogeneous one, in its dentition as well as in the characters of the skull. The *Sciuropteri*, on the contrary—with which I propose to unite *Pteromys tephromelas*, Günth., and *Pt. phæomelas*, Günth.—show on closer examination such a variety in the shape of their molars, that, if found in a fossil condition, they would without hesitation have been assigned to four or five genera. All of them are more or less brachydont, with the exception of *Sciuropterus volans*, L. sp., which leans towards hypsodontism; all have in common an elegant sculpturing of the enamel, which gives often a crenate appearance to the cusps or crests. But, apart from this, almost every species possesses a peculiar pattern of its molars.

[1] 'Nagerüberreste aus Bohnerzen Süddeutschlands und der Schweiz,' 1873.

[2] M. Schlosser, "Die Nager des europäischen Tertiärs," *l. c.* pp. 91(73)–93(75), pl. vii. (ii.) figs. 3, 10.

[3] *L. c.* pp. 91, 146, 154.

[4] L. Rütimeyer, "Die Eocäne Säugethierwelt von Egerkingen" (Zürich, 1891), pp. 94–98, pl. vii. figs. 18, 19.

[5] Lemoine, "Etude d'ensemble sur les dents des Mammifères fossiles des environs de Reims," Bull. Soc. Géol. France, t. xix. 1891, pl. x. fig. 65.

Similar remarks apply to the skull. As to molar-forms, I draw attention to two of the most curious in this respect, those of *Sciuropterus horsfieldi*, Waterh. (Plates VIII. and IX. fig. 21), and *Sciuropt. pearsoni*, Gray (Plates VIII. and IX. fig. 20). The upper molars of both of these show, on the inner side, two crescents or cusps, with an intervening depression—a conformation which in recent adult Sciuromorpha is quite unique, but is met with in the Eocene genera *Sciuroides*, *Ischyromys*, *Pseudosciurus*. *Pseudosciurus*, moreover, though being somewhat more brachydont than *Sciuropt. pearsoni*, has in common with it the sculpturing of the enamel, as well as the pattern of the crown in general, there being six cusps in the upper molars, which in the living species show a tendency to form crests. *Sciuropterus horsfieldi* shows other relations to *Sciuroides*, besides those already mentioned.

Now, how are we to account for this astonishing variety of forms, which show this group in a new and unexpected light? The brachydontism for one thing proves that the *Sciuropteri* are old forms, and we have seen that they made their appearance certainly in the Middle Miocene in a form which has undergone very little change up to the present day, and that nearly related forms appear in the Oligocene of France and England, and in the Miocene of Oregon. Moreover, the nearest related fossil forms, of two of the species at least, are Eocene. In stating this, I do not pretend to say that *Sciuroides* and *Pseudosciurus* were Flying-Squirrels, but only that there is a near relationship between them and the two *Sciuropteri* mentioned.

Now, as to the genetic relation of the flying to the ordinary Squirrels, there are three suppositions possible:—

(1) The most obvious would be to admit that the Flying-Squirrels have evolved from various species of non-flying Sciuromorpha. In favour of this supposition it could be said that, considering Flying-Squirrels to be more specialized, they have apparently evolved from less specialized forms, and that the more favourable conditions in escaping their enemies might account for the survival of such forms as *Sciuropt. horsfieldi* and *Sc. pearsoni*, whose nearest relations were largely represented in the older Tertiaries. In support of a supposed independent evolution of the species of *Sciuropteri* from several species of *Sciuri*, the fact might be adduced that there exists some similarity in the dentition of an Oriental *Sciuropterus* (*Sc. fimbriatus*, Gr.) with several Oriental *Sciuri* (*Sc. prevosti*, e. g.); and the same might be said with regard to the Nearctic *Sciuropterus volucella*, Pall. sp., as compared with several Nearctic *Sciuri*.

(2) A second possible supposition would be the reverse of the first. For one reason or other, a patagium might have proved disadvantageous, and the *Sc. hudsonius* might be the descendant of such a form as *Sciuropt. volucella*, as *Sciurus prevosti* and other Oriental *Sciuri* might have sprung from some *Sciuropterus fimbriatus*. In favour of this supposition, the fact might be adduced that the species of *Sciuropteri* and *Pteromys*, taken together, are

inferior in number to the non-flying Sciuromorpha, and have, to all appearances, greatly diminished from Tertiary times up to the present, so that their special means of locomotion do not seem to have proved of more value in the struggle for existence to those of the non-flying.

(3) One may thirdly suppose that there is no direct connexion whatever between the *Sciuropteri* and recent *Sciuri* or *Sciuridæ*. From Tertiary times up to the present, the species of Flying-Squirrels have been gradually diminishing in number, their characters having proved inadaptive, whilst the species of Sciuridæ have been increasing. The points of similarity in the grinding-teeth of *Sciurus prevosti* and *Sciuropterus fimbriatus*, on the whole, are very slight (and so are those between *Sciuropterus volucella* and *Sciurus hudsonius*); with a little practice it is at once possible to distinguish an isolated tooth of the one from that of the other. Their skulls, moreover, are very different.

For my part, I rather incline towards the third supposition, although admitting that the grounds on which it is based may not be convincing. At any rate, the characters of the cranium as well as those of the dentition, though greatly varying, give on the whole a family likeness to all the Flying-Squirrels, so that I cannot but separate them into a distinct subfamily from the Sciurinæ.

The *Pteromys, sensu strictissimo*, have probably evolved from a single *Sciuropterus*-like form, and *Eupetaurus* is apparently the more specialized descendant of some *Pteromys*.

The really important characters in which some *Sciuri* and *Spermophili* approach the *Sciuropteri*, as in the restricted interorbital region of *Colobotis*, the general elongation of the frontals of various Sciuridæ, the general shape of the grinding-teeth in *Eosciurus*, and in the stronger development of the first ridge in the upper molars of the *Otospermophili*, are all such that they may be considered as ancient inheritances.

Therefore we need not admit any recent connexion between the *Sciuropteri* and the above-mentioned members of Sciuridæ.

Anatomical characters and palæontological evidence point in the same direction, viz. that the *Sciuropteri* are the little modified remnants of a very old and once widely spread group. There is not sufficient evidence for admitting that they have evolved from forms of non-flying Squirrels identical with, or very closely allied to, those actually living; their power of flying may not be a comparatively recent character. They are specialized, no doubt, compared to the remnant of Sciuridæ; but the ancestral non-flying types may neither have been Sciuridæ nor even Sciuromorpha.

It would be more consistent with these views to place the Flying-Squirrels in a distinct family; but for this it will be time enough when their recent as well as their fossil forms are better known than is the case at present[1].

[1] The present paper was completely finished when I first became partially acquainted with H. Winge's "Jordfundne og nulevende Gnavere (Rodentia)

V. *On the primitive Type of the Sciurine Molar, and of the Eutherian Molar in general.*

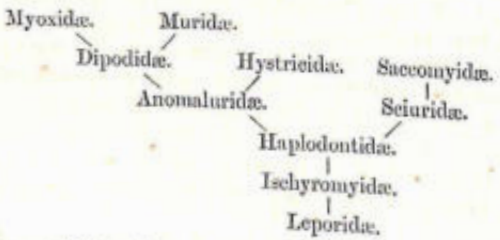
In surveying the various modifications of the Sciurine molar-type, I refrained from entering into the question as to their relation to the prevailing theory of trituberculism. I proceed now to this last part of my paper.

The tritubercular theory has been worked out with admirable acumen by Cope, Osborn, Schlosser, and lastly by Rütimeyer and Scott, and is so well known that I need not even give a summary of it. However, as I have to refer in the sequel to some less recent papers bearing on the argument, I may be allowed to mention them here as briefly as possible.

In a Memoir, which may be regarded to contain the foundations of a real comparative Odontography, Rütimeyer was led to consider as fundamental type of the Ungulate molar the zygodont form, viz. the upper molars formed by two transverse ridges, parting under right angles from an outer wall ("*Aussenwand*"), with a transverse valley dividing them, and two simple transverse ridges in the lower molars[1].

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fra Lagoa Santa, Minas Geraes, Brasilien. Med Udsigt over Gnavernes indbyrtes Slaegtskab" (Aftryk af "E Museo Lundii," Kjobenhavn, 1887). I regret not to have known this important publication before, but shall be obliged to take it into full consideration on the first opportunity if I succeed in overcoming the difficulties presented by the language. Meanwhile, at the risk of not having in every instance completely grasped the author's meaning, I cannot refrain here from a few observations. Winge presents (p. 110) the following genealogical tree of the Rodentia:—



Pseudosciurus and *Sciuroides* are included as a distinct subfamily under the Anomaluridæ, which last contain, moreover, besides *Anomalurus* (subf. *Anomalurini*), the Tertiary *Trechomys* (*Trechomyini*), *Theridomys*, *Issiodoromys*, *Archæomys* (*Theridomyini*), and the recent *Pedetes* (*Pedetini*). I do not in the least deny the importance assigned to the masseter (in its relation to the mechanical action of the teeth), and, as a consequence, to the shape of the infraorbital foramen. However, the agreement in the molars of *Sciuroides* with those of *Sciuropterus horsfieldi* on the one side, and of *Pseudosciurus* with those of *Sciuropterus pearsoni* (and to a lesser extent of *Allomys*) on the other, is such that I do not think it justified to separate so widely these fossil forms from the *Pteromyinæ*. Besides, amongst *Sciurinæ* proper, *Protoxerus*, my first subgenus of *Xerus*, still presents, in the conformation of the infraorbital foramen, some approach to the primitive condition.

[1] L. Rütimeyer, "Beiträge zur Kenntniss der fossilen Pferde und zur vergleichenden Odontographie der Hufthiere überhaupt," Verh. d. naturf. Ges. in Basel, iii. 1863, p. 558, gg.

Rütimeyer starts from the assumption that the primitive type of Mammalian molars had a conical or cylindrical shape ("*homœodont*" type), which simple form became complex in course of time, so that we must expect to find a more simple type of molars the more we recede in time. Rütimeyer's views were supported by the fact that, in several of the oldest deposits then known, of Tertiary Mammalia were met with abundantly the Lophiodontidæ, showing the zygodont molar in its typical form.

Kowalevsky[1] held the same views as Rütimeyer and pointed out, besides, that a less simply constructed form of molars is met with in the older Tertiary, especially amongst "primitive Ungulates" (e. g. "*Microchœrus*")[2]. But whilst he did not enter upon the possible relations between such complex sextubercular forms and the zygodont or lophodont type (as it was called later), Cope had urged already, in 1874, that a bunodont tooth was the ancestral form of the modern placental molar, thus tacitly admitting that the zygodont molar is a secondary, a derived form[3]. The various modifications of ungulate molars were traced back by Cope to a quadritubercular type, and somewhat later he traced the sectorial type of inferior molars to a quinquetubercular or tuberculosectorial type[4].

The discovery of the Puerco, the oldest known Tertiary Mammalian fauna of America, gave opportunity for the recognition by Cope of a still more primitive type of superior molar, the tritubercular type, the great majority of the Puerco Mammals having, according to Cope, their superior molars constructed after this type[5]. In the latest review of the Puerco fauna it is stated that almost all the Placentalia show the tritubercular type in their superior molars, as, out of 82 Placentalia, only four are quadrituberculate. The quinquetuberculate or tuberculosectorial type of inferior molars is equally widely spread, although less generally so, 64 out of 82 Placentalia possessing it[6].

The farther development of the tritubercular theory in these last years is treated of at length in all the recent Manuals, as the whole phylogeny of the Mammalia is directly connected with the question.

Not one palæontologist who has dealt with the argument has

[1] W. Kowalevsky, "Monographie der Gattung *Anthracotherium*, Cuv.," Palæontographica, xxii. 1873. 1874, pp. 210, 263, 264.

[2] "Je tiefer wir in die Schichten dringen, je ältere Formen wir finden, desto complicirtere Gestalten tauchen immer auf. . . . ; also kann das als ein Wink dienen, wie weit wir noch von der primitiven Form des Zahnes sind" (*l. c.* p. 230, note 1).

[3] E. D. Cope, "On the Homologies and Origin of the Types of Molar Teeth of Mammalia Educabilia," Journal Academy Nat. Sciences of Philadelphia, new series, vol. viii. part 1 (Philadelphia, April 1874), pp. 71–89.

[4] *L. c.* and E. D. Cope, "On the Trituberculate Type of Molar Tooth in the Mammalia," Pal. Bulletin, no. 97, Proc. Amer. Philos. Soc., Dec. 7, 1883 (publ. Jan. 2, 1884), p. 326.

[5] "On the Trituberculate Type &c.," *l. c.*

[6] E. D. Cope, "Synopsis of the Vertebrate Fauna of the Puerco Series," Transact. American Philos. Soc., Aug. 1888, p. 299.

pronounced unfavourably on the theory since it was first brought forth, and the same is the case, so far as I am aware, with biologists in general.

The cardinal point established, to use Osborn's words, is that "*the antero-external cusp in the lower molars and the antero-internal cusp in the upper molars of the Mammalia are homologous with the reptilian cone and with each other*"[1].

Trituberculism, or, as we rather ought to call it, the reptilian-cone theory, is no more a theory, but has become a dogma. I am a heretic, and may say that I opposed the theory already in 1873, viz. before it was invented[2]; since that time I have kept silent for various reasons.

My intention is not to deal fully with the subject on this occasion; I wish only to present a few general remarks on what I consider to be weak points of the theory, and then to enter on more particulars so far as the Sciurine type of molars is concerned.

It is but fair to begin with the Puerco fauna, the stronghold of trituberculism, from the discovery of which dates the establishment of the theory. In this fauna we have 106 species of Vertebrates[3], the most numerous being the Condylarthra with 23, and the Creodonta with 50 species[4]. I have already stated that, according to Cope, amongst 82 Puerco Mammalia only four are quadritubercular, all the rest being tritubercular.

Now it appears to me that the Puerco fauna, as at present known, does not give us an adequate idea of what must have been the Mammalian life of that period, the proportion of carnivorous Mammalia being far too large to be a real one. So that we meet here with exactly the same mode of argument which years before had been resorted to with regard to the zygodont type. In the oldest (then well-known) Tertiary Mammalian faunas the Lophiodontidæ, showing a relatively simple type of molar, were richly represented; hence it was concluded that this was the primitive type of the ungulate molar. Rütimeyer has recently strongly insisted upon the fact that the Carnivorous Mammalia of the Egerkingen fauna, the same which has yielded numerous remains of Lophiodontidæ, are exceedingly poorly represented, the remains of Ungulata being more than twenty times in excess of those of Carnivora[5]. In the Puerco, on the other hand, where we have an analogy to the Egerkingen[6] fauna in regard to primitive types,

[1] Osborn and Wortman, "Fossil Mammals of the Wahsatch and Wind River Beds, Collection of 1891," Extr. from Bulletin of the American Museum of Nat. Hist. iv. no. 1, Oct. 1892, p. 85.

[2] Forsyth Major, "Nagerüberreste aus Bohnerzen Süddeutschlands und der Schweiz. Nebst Beiträgen zu einer vergleichenden Odontographie von Ungulaten und Unguiculaten," 1873. Palæontographica, xxii.

[3] Cope, 'Synopsis Puerco Fauna,' p. 300.

[4] *Id. ib.* pp. 304, 305.

[5] L. Rütimeyer, "Die Eocäne Säugethierwelt von Egerkingen," Abhandlungen d. schweiz. paläontol. Ges. vol. xviii. 1891, p. 93.

[6] Rütimeyer, *ib.*

the proportion is reversed. The Creodonta, with, on the whole, a simple type of molars, prevailing in the Puerco fauna, this fact has been considered as conclusive for Cope's theory, that the Mammalian molar is derived from a tritubercular type.

Secondly, I cannot acknowledge that many of the Puerco molars said to be trituberculate, are really such; several species of *Mioclænus*, for example, showing a rather complex type.

Now, considering the fact that we meet amongst the so-called trituberculate types with molars which really are septem-, octo-, and novem-tuberculate, it would have been more correct to speak of a triangular type, this shape of the outline being the only thing the molars in question have generally in common. But they are not all even triangular forms, as those presented by "*Conoryctes*" *ditrigonus*[1], or *Periptichus rhabdodon*[2], show on either side of the principal inner cusp two secondary cusps, and Rütimeyer has recorded similar types from Egerkingen.

Moreover, Cope is not consistent with his own theory when he expounds his views as to the mutual relations of Creodonta[3]. The genus *Mioclænus*, from which all the other Creodonta are said to be derived, possesses the most complex structure of molar of them all; whilst *Mesonyx*, whose upper molars present a simple tritubercular type, is placed at the end of a series instead of the beginning, as the theory would require.

I further find inconsistencies in his diagram showing "the facts and hypotheses as to the phylogeny of the Mammalia"[4]. Here the Creodonta and Carnivora, as well as all the other placental Mammalia, with the exception of the Cetacea, are traced back by Cope to the Condylarthra. The latter, together with the Marsupialia, are derived from the Monotremata. This derivation implies that in the opinion of Prof. Cope the Monotrematous teeth must have been constructed on a trituberculate or a still more simple plan; and it may be remembered that when the first figures of worn teeth of *Ornithorhynchus* were published, they were proclaimed to support the tritubercular theory. But they are now known to be multituberculate: so I suppose that this being the case, the argument will probably be considered of no value, the *Ornithorhynchus* being an aberrant *Protothere*. But still the fact remains, and we must deal with it, that the only prototherian teeth known to this day are multituberculate to the extreme.

If I am not mistaken, the above views of Cope as to the mutual relations of the different orders of Mammals,—views which are in opposition with trituberculism,—show that their author is on his way, unconsciously perhaps for the present, to become a partisan of the multitubercular origin of Mammalian teeth, so that support

[1] E. D. Cope, 'The Vertebrata of the Tertiary Formations of the West.—I.,' 1883, pl. xxiv. *d*. figs. 2, 4.

[2] *Ib.* pl. lvii. fig. 1 *a*.

[3] 'Synopsis Puerco Fauna,' p. 309.

[4] E. D. Cope, "On the Evolution of the Vertebrates, progressive and retrogressive," Amer. Naturalist, February, March, April, 1885 (printed April 13, 1884), p. 347.

seems to be coming to me from the very side from which it was least expected.

Schlosser in his turn has, in his elaborate and valuable Monographs[1], taken tritubercularism as his guide for tracing the phylogeny of various orders of Mammalia. He states his ground to be as follows:—"We have but to start from the perfectly recognized primitive type and to trace the modifications which it has undergone"[2]. This perfectly recognized primitive type is, according to Schlosser, the tritubercular type of upper molars, and the tuberculo-sectorial type of lower molars. Accordingly, in the diagram placed by him at the head of the Monograph of Carnivora[3], this form of molar type is attributed to the supposed first true Carnivore.

In accordance with the theory, Schlosser considers *Mesonyx* or *Sarcothraustes* to be the primitive type of Carnivora[4]. With the same inexorable logic all Ungulates are derived from carnivorous Mammalia; the Condylarthra being considered as intermediate between the Ungulata and Creodonta[5].

I have not to deal with Carnivora on this occasion, so that I will only mention incidentally that, in my eyes, amongst recent Carnivora, the Subursi (and, so far as the form of molars is concerned, *Ailurus*) approach nearest to the primitive carnivorous Mammalia, whilst some of the Arctocyonidæ are the most primitive of Creodonta.

Further objections may be made when Schlosser considers with Cope a rather complicated form of inferior molar—the tuberculo-sectorial type—to be a primitive form, and when it is assumed that, whilst the upper molars become further modified by addition, the lower molars from quinquetubercular become quadritubercular in progress of time, by the loss of an anterior cusp, the paraconid. The tuberculosectorial type is, in its turn, derived from a simpler

[1] M. Schlosser, "Beiträge zur Kenntniss der Stammesgeschichte der Hufthiere und Versuch einer Systematik der Paar- und Unpaarhufer," Morpholog. Jahrbuch, xii. 1887, pp. 1–136;—*id.* "Die Affen, Lemuren, Chiropteren, Insectivoren, Marsupialier, Creodonten und Carnivoren des europäischen Tertiärs und deren Beziehungen zu ihren lebenden und fossilen aussereuropäischen Verwandten," I.–III., Wien, 1887–1890 (Beiträge z. Paläontologie Oesterreich-Ungarns, Bd. vi.–viii.);—*id.* "Ueber die Beziehungen der ausgestorbenen Säugethierfaunen und ihr Verhältniss zur Säugethierfauna der Gegenwart," Biologisches Centralblatt, Bd. viii. no. 19, Dec. 1888, pp. 582–631.

[2] "Es handelt sich nur darum, von dem wohlerkannten Grundtypus auszugehen und alle Veränderungen zu verfolgen, welcher derselbe fähig ist," Die Affen, &c. ii. p. 9 (233).

[3] *Id. ib.* p. 4 (228).

[4] "Wenn wir von der Voraussetzung ausgehen—und hiezu sind wir auch vollauf berechtigt—dass der *Oberkiefer-Molar* der Creodonta ursprünglich den Trituberculartypus in vollster Reinheit gezeigt habe, so müssen wir *Mesonyx* oder *Sarcothraustes* unbedingt als den Urtypus betrachten, wenigstens für jene Formen, deren obere Molaren mit *rundlichen* Höckern versehen sind. Es schliessen sich diese Typen mehr an die Raubbeutler als an *Didelphys* an," Die Affen, Lemuren, etc. i. p. 161.

[5] ". . . es kann keinem Zweifel unterliegen, dass alle Hufthiere von Fleischfressern abstammen, wobei eben die Condylarthren das Zwischenstadium repräsentiren"—M. Schlosser, Ausgestorbene Säugethierformen, *l. c.* p. 585.

form by the addition of the so-called *heel* or *talon* to the original trigon.

The name of *heel* or *talon* is borrowed from the teeth of Carnivora, where this part, as the name implies, generally appears in a reduced form compared with the rest of the tooth. In other orders the so-called *talon* is, as a rule, a well-developed part of the inferior molar, so that it seems *a priori* highly improbable to consider as a later development that part which, in the majority of Mammalia, constitutes the whole posterior moiety of the lower molars. What we at present know of the oldest forms of Perissodactyla, Condylarthra, Rodentia, and even of some forms of Creodonta, as revealed especially by the Cernaysian fauna of Reims[1], does not in the least justify a similar assumption. On the contrary, the "*talon*," far from showing a tendency to disappear, is in several of these archaic *Eutheria* very prominent, and even more distinctly developed than in any later form, not only in longitudinal extension, but partly even in the elevation of the cusps, as compared with those of the anterior moiety.

The question of the heel leads us to an objection made by Fleischmann, who on the whole accepts the tritubercular theory, but maintains that the cusps of upper molars are not directly homologous to those of the lower molars; or, in other words, that not only does the internal side of upper molars correspond to the external side of lower molars, as admitted by Cope and Osborn, but that, besides, the anterior part of upper corresponds to the posterior part of lower molars[2].

In reply to Fleischmann, Osborn states that "this objection would be fatal to a uniform system of nomenclature for the upper and lower cusps if it could be sustained," but that it is disproved by a comprehensive survey of the Mesozoic trituberculates, especially of the Amblotheriidæ and Spalacotheriidæ[3]. Neither Osborn nor Fleischmann seem to be aware that, if the latter *is* right, his objection will be fatal not only to the homology of upper and lower cusps, but also to the theory, for the primitive trigon which includes the protoconid, the supposed homologue of the reptilian cone, would in that case be found to be formed for the greater part by the very heel which the theory considers to be a late addition.

There can be no doubt as to the correctness of Fleischmann's statement, which is easy to verify. A left upper anterior milk-tooth of *Didelphys*, for instance, is at first sight very difficult to distinguish from one of the right lower series. Even in such specialized molars as those of modern Ruminants, in holding side by side a right upper and a left lower molar, or *vice versa*, what appear to be the mutual homologies are to be traced out even to

[1] Lemoine, "Etude d'ensemble sur les dents des Mammifères fossiles des environs de Reims," Bull. Soc. Géol. de France, iii^e série, t. xix. 1891, pp. 263–289, pls. x., xi.

[2] A. Fleischmann, "Die Grundform der Backzähne bei Säugethieren und die Homologie der einzelnen Höcker" (Sitzungsber. d. k. Preuss. Akad. d. Wiss. Berlin, 1891).

[3] Osborn and Wortman, *l. c.* pp. 84, 85.

very small details. The only inference I wish for the present [1] to draw from this fact and its consequences is, that Prof. Fleischmann, too, is on his way to become an opponent of trituberculism.

It would appear that the Allotheria, the Multituberculata *κατ' ἐξοχήν*, ought to have been a stumbling-block for the theory. But this is not the case; they have been simply pushed aside on account of being an aberrant order. Nevertheless, I shall refer to them later on.

The dentition of Rodentia has as yet not much been dealt with in relation to the tritubercular theory. Scott was the first to touch upon the question, when describing the *Plesiarctomys sciuroides*, S. & O., from the Uinta formation[2], considered by him to be "one of the oldest, if not the very oldest known form of rodent." Owing to the importance which for this reason is attributed to the fossil, I must dwell upon the subject at some length. Scott has shown to his own satisfaction and to that of others that the superior molars of *Plesiarctomys sciuroides* "are plainly of the tritubercular pattern," and that "the inferior molars show the anterior triangle of three cusps with a talon behind, or what Cope has termed the tuberculo-sectorial molar." It might be questioned at once whether this specimen, the teeth of which are much worn according to the author's own assertion [3] and according to what appears from the diagram [4] and the figures [5], is a proper object from which to draw such important inferences. I fail to see in its molars anything else than the usual Sciuromorphine type, which I agree with Scott in considering as a very old one. I have myself pointed this out twenty years ago in some fossils (*Sciurus spectabilis*) from the Eocene of Egerkingen [6], which are rather older than the Uinta formation. The Uinta beds are considered by Zittel [7] to be Lower Oligocene, whilst the Bohnerz of Egerkingen has important relations with the oldest Eocene of Europe (Reims) and America (Puerco)[8]. On the other hand, this type is still in existence, and widely spread among living Sciuromorpha.

I think that Scott is mistaken in what he considers to be the homologies, in the lower molars of *Plesiarctomys*, of the anterior triangle of Ungulates, Creodonts, and Lemuroids. This anterior triangle is formed, as clearly shown by unworn molars of most of the Sciuromorpha, by the antero-external and antero-internal cusp (the *protoconid* and *metaconid* according to Osborn's nomals" (Proc. Ac. Nat. Sci. Philad. 1892, p. 410).

[1] See also W. B. Scott, "The Evolution of the Premolar Teeth in the Mam-

[2] William B. Scott and Henry Fairfield Osborn, "The Mammalia of the Uinta Formation" (Trans. Amer. Philos. Soc. n. s. vol. xvi. pt. iii. Aug. 20, 1889, pp. 476–478).

[3] *L. c.* p. 477.

[4] P. 476.

[5] Pl. xi. 1 *c*, 1 *d*.

[6] Forsyth Major, "Nagerüberreste aus Bohnerzen Süddeutschlands und der Schweiz."

[7] 'Handbuch der Paläontologie, I. Paläozoologie,' IV. Band, 1892, p. 66.

[8] L. Rütimeyer, "Die Eocäne Säugethierwelt von Egerkingen," Abhandl. schweiz. paläont. Ges. xviii. 1891.

menclature)[1] more or less transversely united, together with Osborn's *paraconid*[2], and include between them what I have called the anterior transverse valley. Owing to the much-worn condition and partly too, perhaps, to the feeble development of this anterior part—as found in some recent *Sciuri* and in *Arctomys*—the anterior valley has vanished in the fossil molars, though I think that some traces of it are still visible in the first and third molar of Scott's figures[3], so that, in order to find out the typical triangle, Scott has encroached on what tuberculism declares to be a late addition to the inferior molars, for he considers, as it were, the postero-internal cusp, Osborn's *entoconid*, of the "heel" to be the postero-internal part of the typical triangle. What he calls the talon behind, is but the median cusp (*hypoconulid*) of Osborn's talon. This hypoconulid is in fact the real "talon," viz. that part which is so generally well developed on the posterior side of third lower molars, but which in many Sciuromorpha can be distinctly made out in the anterior molars too, as well as in milk-teeth of *Lepus* and *Myolagus*, and both in milk-teeth and permanent molars of *Lagodus* and *Titanomys*[4].

The conclusions to be drawn from the foregoing analysis are, I am glad to state, the very same at which Scott has arrived, as they tend to show, even more unmistakably, "that the Rodents are to be derived from the same generalized group of primitive placental Mammals, the Bunotheria, to which we refer the origin of the Ungulates, Creodonts, and Lemuroids"[5]. In respect to what Scott considers plainly to be "the tuberculer pattern" of superior molars, it cannot be denied that there appear three principal cusps, two external and one internal one, in the upper molars of *Plesiarctomys sciuroides*; but there are other parts to be seen, even in these much-worn molars, and I have already pointed out that it is dangerous to draw inferences from *worn* teeth.

Very similar remarks apply to two papers by Schlosser[6], in which this author endeavours to refer the molars of Rodentia to tuberculism. I therefore refrain from discussing them at length, and I wish only to remark upon the second of the papers quoted. Schlosser asserts in the most positive manner, what at first sight appears to be a startling fact, that *Plesiadapis* and *Protoadapis*, from the Lower Eocene of Reims, are Rodentia. *Plesiadapis* had previously been

[1] *Cf.*, *e. g.*, H. F. Osborn and J. L. Wortman, "Fossil Mammals of the Wahsatch and Wind River Beds." Collection of 1891. *L. c.* p. 86, figs. 1 & 2.

[2] *Ib.*

[3] *L. c.* p. 476, and pl. xi. fig. 1 *d*.

[4] See also the inferior molars of "*Plesiadapis*" in Lemoine, "Etude d'ensemble sur les dents des Mammifères fossiles des environs de Reims" (Bull. Soc. Géol. de France, trois. série, t. xix. Mai 1891, pl. x. fig. 65 *e*), and of *Dectiadapis*, ibid. pl. xi. fig. 146 *e*, 146 *ss*.

[5] Scott, *l. c.* p. 478.

[6] Max Schlosser, "Die Differenzirung des Säugethiergebisses" (Biol. Centrablatt, Band x. Nos. 8 & 9, Erlangen, 1 & 15 June 1890, pp. 250, 251).—*Id.*, "Ueber die systematische Stellung der Gattungen *Plesiadapis*, *Protoadapis*, *Pleuraspidotherium* und *Orthaspidotherium*" (Neues Jahrb. f. Mineralogie, Geologie und Paläontologie, Jahrgang 1892, Band ii. pp. 239, 240).

considered by Schlosser himself to be a Lemurid [1], and Osborn [2] had placed both of them amongst the Pseudolemuridæ. Whilst fully agreeing with Schlosser in his main conclusions, for reasons which I shall discuss elsewhere, I am again at a loss to see what tritubercularism has to do with the matter [3], and would put but one question: How comes it that both *Protoadapis* and *Plesiadapis*, which are indeed the most ancient types of Rodents hitherto known, show the so-called heel of inferior molars in such a perfect condition [4] in spite of tritubercularism, which considers these parts as a late addition to the original triangle of inferior molars?

I have declared myself opposed to the tritubercular theory, but have limited my remarks hitherto merely to criticism, though occasionally I offered some positive argument in favour of an hypothesis which is in many points the very reverse of the prevailing theory. It remains now for me to justify the position I have taken with regard to it; what I am going to say is partly a summing up of preceding remarks, and partly embraces a far wider field, and will, I have no doubt, meet with some opposition.

No better starting-point could be chosen than the "*Sciuridæ*," amongst which we meet with the most primitive form of molars of this low order of Mammalia.

The adherents of tritubercularism assert that they have proved the Mammalian molar to be traced back to a more and more simple form. I have tried to show that they have failed to do so, and in my turn assert that the molar of Placentalia can be traced to a polybunous form, and that the real tritubercular pattern is a more specialized secondary stage. So that, as a matter of course, the cardinal point to be established is to show, that the more complex forms, which in the Lower Eocene as well as in the recent period are found side by side with the simpler forms, trituberculate or otherwise, are indeed the primitive, the more generalized type.

To prove my assertion, I start from five assumptions:—

1. *Brachydonty is the more primitive, the more generalized condition of molar form, and so is*
2. *Bunodonty, as opposed to Lophodonty (or Zygodonty, which is the same thing).*
3. *The more brachydont a molar is, the more multituberculer it is, or, let us say, polybunous.*
4. *The transformation, viz., the reduction and simplification, pro-*

[1] M. Schlosser, "Die Affen, Lemuren, Chiropteren, Insectivoren etc. des europäischen Tertiärs, etc." Pt. I. Wien, 1887, p. 47.

[2] Henry Fairfield Osborn, "A Review of the Cernaysian Mammalia" (Proc. Phil. Acad. Nat. Sci., May 6th, 1890, pp. 55, 56).

[3] "Dass aber dieser Typus (*i. e.* Tuberculartypus) auch den Ausgangspunkt für die oberen Molaren der Nager darstellt, ersehen wir daraus, dass er sich bei *Sciurus* sogar noch bis in die Gegenwart ziemlich rein erhalten hat." (*L. c.* p. 240.)

[4] Lemoine, *l. c.* pl. x.

ceeds from the inner side outwards in superior, and from the outer side inwards in inferior molars.

5. *The now prevalent transverse arrangement of cusps or lobes is not the primitive condition, but a specialized pattern of the crown.*

The first two points need no discussion, as no biologist of the present day denies them. I thirdly maintain that *the more brachydont a molar is, the more polybunous it is*; so that change, which in our case means reduction, simplification, of the molar-crown elements, goes hand in hand with the gradual progress from brachydonty towards hypsodonty.

In the general survey of Sciurine teeth, it has already been shown that the more the molars are brachydont, the more they are polybunous, so that by this statement alone polybuny is proved to be the primitive condition.

If we examine the outer parts of upper and the inner parts of lower molars, we see that they present much less variation in Brachydontia as compared to Hypsodontia, and in the various stages of Hypsodontia compared together, than does the rest of the crown, especially the inner side in upper and the outer side in lower molars. It therefore at once strikes us, that the outer side of upper and the inner side of lower molars (viz., those parts which, when the jaws are at rest, are protruding over the corresponding parts of the opposite jaw) have undergone the least modifications, that they are the more stable elements of molars. These same sides being generally more complex than the *inner* side above and the *outer* below, we may infer from it that the complex condition is the primary one, and that the reduced, simplified state of the inner side above and the outer side below is a specialized condition, the beginning of which we see already in molars of *Cretaceous Mammalia* and in those of *Ornithorhynchus*.

The extreme of this specialized condition is what has been called trituberculism, and considered to be a primitive pattern of Eutherian molars. It is not more primitive in Ungulata, Condylarthra, Creodonta, and Lemuroidea than in *Sciurinæ*, the species of which, when there is only one cusp on the inner side of upper molars, present an approach to trituberculism.

Now, what is the meaning of this reduction on the inner side of superior, and the outer side of inferior molars?

We have seen that in perfectly brachydont teeth the outer and inner sides of the molars present the least difference from each other in longitudinal extension, as well as in the number of their cusps; and that the superior molar becomes shortened on its inner side, as well as the inferior on its outer side, by the excessive development of some cusps (generally either one or three, rarely two, in *Sciurinæ*) at the expense of others, which are present in such perfectly brachydont teeth as those of *Eosciuri* or *Rhithrosciurus*. The meaning of this process of reduction becomes obvious, when we consider that the internal cusps of superior,

and the external cusps of inferior molars have to fit into the hollows or valleys of the opposing teeth. When there is only one cusp exclusively or prominently developed on the inner side of a superior molar, as in the so-called tritubercular, or at a lesser degree in the trigonodont type, this single cusp fits in the more or less cup-like depression of the posterior moiety of the corresponding inferior molar; in other words, the *protocone*,—viz., the oldest element of upper molars, according to the tritubercular theory—fits in what the theorists consider to be the most modern part of inferior molars. And, *vice versa*, the *postero-external* cusp of inferior molars, that is the *hypoconid* of the "heel," has to fit in the median valley of superior molars, formed essentially by the three cusps of what trituberculism considers to be the primitive trigon of upper molars.

The special development of two inner cusps in superior molars has been shown to be so very rare an occurrence in *Sciurinæ*, that up to the present day it was known only in some fossil forms (*Sciuroides*, *Pseudosciurus*, *Ischyromys*), whereas it is the predominant feature amongst Ungulata. To these two inner cusps correspond two hollows or valleys of the inferior tooth. The relative development of the anterior valley, formed by the so-called primitive trigon of inferior molars, corresponds to that of the postero-internal cusp of superior molars,—the *hypocone*, a later addition according to the tritubercular theory: when the hypocone is suppressed, as in the pure tritubercular type, or feebly developed, as in the trigonodont type, the anterior valley in the lower molars is atrophied or insignificant. It is well developed, to receive the hypocone as a pestle, when this last has the same or almost the same size as the protocone.

Fourthly, we are able to state that *the transformation, viz. the reduction and simplification, proceeds from the inner side outwards in superior, and from the outer side inwards in inferior molars.* Here I have to repeat what I said with regard to semi-hypsodont teeth, viz., that the vertical elevation of the crown, the first stage towards hypsodonty, always has its starting-point from the *inner* side of upper molars. A farther stage of semi-hypsodontism, as presented by the rooted molars of Miocene *Lagomorpha* (*Lagodus*), shows how hypsodontism gradually extends towards the outer side, accompanied by a gradual and essential change of the pattern of the crown. In the same way the inner root, which ultimately will remain open, gradually extends outwards, increasing in size, and receives a coating of enamel. This process is so slow, that for a long time the outer side retains a brachydont as well as a complex conformation.

The fifth point advanced was stated as follows:—*The now prevalent transverse arrangement of cusps or lobes is not the primitive condition, but a specialized pattern of the crown.* What, then, was the primitive condition? The primitive generalized pattern was the exact reverse, viz., the arrangement of cusps in longitudinal series, separated by longitudinal grooves or valleys. This is, indeed,

a cardinal point and will, when once generally recognized, appear to be a simple truth.

Bunodonty, as opposed to lophodonty, is the first step from a transverse arrangement towards the longitudinal one, and is not always to be distinguished at once from the second step I am speaking of, though this last is often characterized by a sort of asymmetry, or confusion, in a way, as is usually the case in transitional stages.

First, as to *Sciurinæ*. As has already been said, transverse *crests* are to be found only in semi-hypsodont types, many of which tend towards the Hystricomorpha, which for their lack of brachydont molars at once show themselves to be more specialized forms. With the exception of Myoxine types—and this exception is only an apparent one—we may say that the more the molars tend towards brachydonty, the more the crests are broken up into cusps. Of these cusps there are generally five on the outer side of upper molars, two or three of which have been prominently developed. In the middle two intermediate, and on the inner side in the same manner as on the other side, originally a *longitudinal* series of cusps were developed, which very soon, viz., when the tooth ceases to be perfectly brachydont (as well as in somewhat worn semi-hypsodont or hypsodont teeth), are reduced in number and tend to become coalesced, a middle *cusp* appearing the most developed. This middle cusp seems to be for the greater part the remnant of a fifth series which have become partially atrophied, in order to give place for the median transverse valley; and it is in consequence of the formation of this valley that the cusps appear arranged in transverse series, even before being connected as ridges or crests.

In superior and inferior molars, the most brachydont members of the family are at the same time those which show a tendency towards a longitudinal alignment of their cusps. The difference between superior and inferior molars consisting in the presence in upper molars of intermediate cusps, in more specialized, viz. less brachydont forms, generally reduced to two, as before stated, but which, as shown by the most brachydont forms, are the remnants of one or more longitudinal series of cusps or tubercles, intermediate between the outer and the inner series.

The cup- or basin-like shape of inferior Sciuromorphine molars is but a slight specialization of a primitive type, a disposition of the cusps on the outer and inner margin, with an intervening longitudinal depression. The slight specialization consists in the beginning of a transverse arrangement. In the Bornean *Rhithrosciurus* (Plate IX. fig. 2), the whole of the very brachydont inferior molars consists mainly of two series of marginal cusps, none specially developed, and with a spacious longitudinal groove dividing the outer from the inner series; thus pointing significantly towards some primitive mammalian molars remote in time (*Microlestes*). And so the curious *Pseudosciurus*, from the Upper Eocene of Southern Germany, shows the tendency towards, or, as we rathe

should say, the traces of, a primitive arrangement of its tubercles of upper molars in three longitudinal series, there being two rows in the lower molars.

This paper does not pretend to enter into details as to other families and orders. But I think it important to state in a few words that this tendency of older forms towards a longitudinal arrangement is quite general in Rodents as well as in Creodonts, Lemuroids, and Ungulates. In Sciuridæ we have very primitive forms still existing side by side with those more specialized, so that the transverse arrangement does not at first sight appear to be a later transformation. The Lagomorpha are in this respect, as in others, highly instructive, the molars of the living members being very specialized. I hope to show fully on another occasion that the structure of the molar form of Lagomorpha is to be traced back from the perfect transverse direction presented by their enamel-ridges to a pelycodoid type of molar, that means, to a molar approaching closely to those of *Pelycodus*, a mammal from the Lower Eocene of North America and Egerkingen in Switzerland, which has hitherto been considered to be a Lemuroid. In a somewhat lesser degree, the Lagomorphan molar tends towards *Esthonyx*, considered by Cope [1] to be one of the progenitors of Rodentia.

The intermediate stages are the unworn milk-teeth, premolars and molars, of young *Lepus*, the Miocene *Palæolagus*, *Lagomys*, the Pleistocene, Pliocene, and Miocene *Myolagus*, and the Miocene *Lagodus*. The anterior upper and lower premolar of *Lepus*, the second superior and the anterior inferior premolar of *Lagomys*, the superior premolars and more or less all the superior molars of *Myolagus*, as well as the inferior anterior premolar of the latter, show, even in adult specimens, a conformation which points unmistakably towards a longitudinal arrangement of partially sharp-edged cusps—these cusps being three longitudinal series separated by two longitudinal grooves in the upper teeth, and two series with one intermediate longitudinal groove in the lower molars. The difference between the first lower premolar and the other grinding-teeth is very striking, especially in *Myolagus*, for which I refer to a figure from Filhol's memoir on the Sansan fauna [2].

As to other Orders, I must be satisfied to give a few instances. Amongst recent Carnivora, the Subursi, especially *Ailurus*, and partially the Ursidæ themselves, show unmistakably the longitudinal arrangement of their molar cusps. In the same direction the milk-teeth of several Orders point significantly, even those of modern Ruminants.

In the Lower Eocene many molars of various Orders tell the same tale as to their origin, often in a distinct manner. In favour of my view I refer to the following figures:—First, from Cope's

[1] E. D. Cope, "The Mechanical Causes of the Development of the Hard Parts of the Mammalia" (Journal of Morphology, vol. iii. Boston, U.S.A. 1889, p. 263).

[2] 'Études sur les Mammifères fossiles de Sansan' (Paris, 1891), pl. i. fig. 8.

Tertiary Vertebrata: *Calamodon*[1], *Anisonchus*[2], *Ectocium*[3], *Peripty-chus carinidens*[4], *ditrigonus*[5], and *rhabdodon*[6], *Palæosyops lævidens*[7], *Phenacodus*[8], *Protogonia*[9]. Secondly, from Lemoine's 'Etude d'ensemble sur les dents des Mammifères des environs de Reims'[10]: *Hyænodictis*[11], *Dissacus*[12], *Arctocyon*[13], *Lophiodochærus*[14], *Pleura-spidotherium*[15], *Pachynolophus maldani*[16], *Protodichobune owenii*[17]. Thirdly, from Rütimeyer's 'Eocäne Säugethierwelt von Egerkingen'[18]: *Ailuravus*[19], *Pelycodus helveticus*[20], *Hyopsodus*[21], "*Plesiadapis*?"[22], *Acotherulum*[23], *Cebochærus*[24], *Lophiodon parisiense*[25], *Paloplotherium magnum*[26]; the last two only so far as their milk-teeth are concerned.

I wish to answer in advance an objection which will certainly have occurred to the reader. The extreme of complication is met with in such highly specialized recent forms as *Hydrochærus*, *Phacochærus*, and *Elephas*, and to a lesser extent in semi-rooted molars, especially amongst Rodentia. As to the supposed more complex form of these last, it is only apparent. A worn molar of *Hystrix*, for instance, seems rather more complex than the rooted molar of *Erethizon*, but on examining unworn grinding-teeth of *Hystrix*, even the seemingly very complex milk-tooth only presents five more or less transverse enamel-folds.

The worn molars show a large quantity of enamel-islets, and thus have a very complex appearance; but this is not the consequence of an augmentation of enamel substance, or additional cusps, but, on the contrary, of diminution of the enamel, which diminishes in the proportion that the worn surfaces approach the roots.

Besides, I have always maintained that in progress of time a new addition may occasionally have occurred in molars; but it would appear that in one instance at least I was mistaken. Contrary to Owen[27], and all later palæontologists, with the only

[1] 'The Vertebrata of the Tertiary Formations of the West,' pl. xxiv. e. fig. 22.
[2] *L. c.* pl. xxiv. g. fig. 6.
[3] *L. c.* pl. xxv. e. fig. 12.
[4] *L. c.* pl xxiii. d. figs. 14, 15, pl. xxiv. g. fig. 5.
[5] *L. c.* pl. xxiii. g. fig. 12, pl. xxix. d. fig. 2–4.
[6] *L. c.* pl. lvi. f. figs. 1 *a*, 2 *a*.
[7] *L. c.* pl. l. fig. 3.
[8] *L. c.* lvii. b. fig. 1.
[9] *L. c.* pl. xxv. e. fig. 13, pl. xxix. f. fig. 1 *a*, pl. lvii. f. fig. 8.
[10] *L. s. c.*
[11] *L. c.* pl. x. fig. 4.
[12] *L. c.* pl. x. fig. 2.
[13] *L. c.* pl. x. figs. 14, 18, 20, 22, &c.
[14] *L. c.* pl. xi. fig. 129.
[15] *L. c.* pl. xi. fig. 87.
[16] *L. c.* pl. xi. figs. 117, 118.
[17] *L. c.* pl. xi. fig. 132.
[18] *L. s. c.*
[19] *L. c.* pl. vii. figs. 18, 19.
[20] *L. c.* pl. viii. fig. 1 (partim).
[21] *L. c.* pl. viii. figs. 7, 8.
[22] *L. c.* pl. viii. figs. 16, 17, 21.
[23] *L. c.* pl. iv. figs. 22, 24.
[24] *L. c.* pl. iv. fig. 30.
[25] *L. c.* pl. i. fig. 8 (d_3 sup.).
[26] *L. c.* pl. i. fig. 1 (*d* sup.).
[27] Rich. Owen, "Description of the Cavern of Bruniquel and its Organic Contents. Part II. Equine remains" (Phil. Trans. vol. 159, London, 1870, p. 537).

exception of Kowalevsky, who, in the same 22nd volume of the 'Palæontographica,' had expressed an identical view, I had supposed that the two inner lobes of upper equine molars are not homologous with those of *Anchitherium*, but are a more modern addition to the tooth. Now ontogeny, according to Klever [1], suggests that Kowalevsky and myself are wrong.

As to the molars of *Hydrochœrus*, *Phacochœrus*, and *Elephas*, I leave them to ontogenists; and, if I am not mistaken, there is every appearance that we shall not have to wait very long for an answer.

It may be asked whether the pattern of molars towards which the types of almost all the Orders of Mammalia represented in the Lower Eocene tend is nowhere realized.

When I first saw the plates of Marsh's "Discovery of Cretaceous Mammalia," my impression was that the molars figured on plate ii.[2] constitute one of the most important discoveries as regards the ancestry of Placentalia, inasmuch as these figures correspond to what I considered, and have been expounding just now, to approach the presumed *ancestral* form of Mammalian molars. In going over the text, I found that Marsh collocates all these multitubercular teeth in the "aberrant" Order of Allotheria, and states expressly, that "Carnivores, Rodents, and Ungulates appear to be entirely wanting in this unique fauna," and that "a still more surprising fact is the absence of their probable ancestors, unless, indeed, the insectivorous forms are entitled to this important position: many known facts point in this direction" [3]. In Part III. of "Discovery of Cretaceous Mammalia" Marsh again states: "These remains are not transitional between Mesozoic and Tertiary forms, but their affinities are with the former beyond a doubt" [4].

To me it appears, from what we now know of those important fossils called *Allotheria*, we are not entitled to consider the whole Order as an aberrant one, though there may be, and certainly are, aberrant genera. But, on the whole, the Allotheria are not more aberrant than the Myomorpha, for instance.

The discovery of the Laramie mammals led to a controversy between their discoverer and another eminent American palæontologist; but this side of the question has not been taken into consideration, both disputants being agreed in assuming that the multitubercular teeth in question belong to an aberrant group. This aprioristic assumption may have prejudiced the impartial investigation of facts. I cannot enter fully into the question, especially as it would be rash to pronounce too positively on an

[1] Ernst Klever, "Zur Kenntniss der Morphogenese des Equidengebisses" (Morphol. Jahrb. xv. 1889, Leipzig, pls. xi.–xiii.).

[2] O. C. Marsh, "Discovery of Cretaceous Mammalia," American Journal of Science, vol. xxxviii. July 1889, plate ii.

[3] *L. c.* p. 83.

[4] "Discovery of Cretaceous Mammalia.—Part III.," *l. c.* vol. xliii. March 1892, p. 250.

examination of the figures and descriptions without having seen the originals; but I wish to offer a few remarks.

Marsh has considered a certain number of isolated molars, possessing three longitudinal pairs of elevations, to be upper molars, although the type of *Dipriodon robustus*, the only molar which is *undoubtedly* from the upper jaw, left side, "its position being decided by a portion of the maxillary attached to it,"[1] apparently has only two longitudinal rows. This circumstance has given origin to part of Osborn's criticisms[2]. The type of *Tripriodon cælatus*[3], considered by Marsh[4] as the first upper molar of the left side, as well as the type of *Selenacodon fragilis*[5], also stated to be an upper molar (both having three longitudinal rows of cusps), are declared by Osborn to be respectively a last lower molar of *Meniscoessus*, and an anterior lower molar of the same[6]. In a subsequent note[7] Osborn writes as follows:—"It remains for the author to show specifically that the types of *Selenacodon* and *Tripriodon* are maxillary teeth," adding: "I should myself have considered them as such but for the fact that the type of *Dipriodon robustus*, with two rows of tubercles, was described as a maxillary tooth, and figured with a supposed fragment of the zygomatic arch attached to the alveolar border." With regard to the upper molars, Marsh asserts, in his latest paper on the subject, that he has the means of showing what Osborn has objected to: "Although not found in position in any one specimen, so many have been secured with portions of the jaw attached, that their place in the dental series has been ascertained in several forms;" and he goes on to state, "that the upper molar teeth may be separated into two series, the first having three longitudinal rows of elevations on the crown, and the second series but two rows"[8]. With the caution imposed by the fact that I am judging only from the published figures, I venture to suggest that the type of *Dipriodon robustus*, which has the undoubted fragment of the zygomatic arch attached to the alveolar border, had originally three longitudinal rows of cusps, the middle one being worn off. Marsh himself states that its "points are somewhat worn"[9], and this appears to me clearly shown in his figure[10]. If we now assume that where there are three rows of tubercles above and two below, "the cusps of the lower rows fit into the valleys of the upper teeth"[11] (which in my

[1] Marsh, *l. c.* part I. p. 85, pl. ii. figs. 13–15.

[2] As stated by Osborn himself in "A Reply to Professor O. C. Marsh's 'Note on Mesozoic Mammalia.'" Reprinted with slight alterations from the 'American Naturalist,' September 1891. p. 782.

[3] Marsh, *l. c.* part I. pl. ii. figs. 19–21.

[4] *L. c.* p. 86.

[5] Marsh, *l. c.* part I. pl. ii. figs. 22–24, p. 86.

[6] H. Fairfield Osborn, "A Review of the Cretaceous Mammalia" (Proc. Acad. Nat. Sc. Philadelphia, 1891. p. 128).

[7] A Reply to Professor O. C. Marsh's Note, &c., p. 782.

[8] Part III. p. 253.

[9] Part I. p. 85.

[10] *L. c.* pl. ii. figs. 13, 14.

[11] Osborn, "A Review of the Cretaceous Mammalia."

opinion allows only for a movement in the longitudinal direction), this mechanical action of the jaw would be followed by the wearing away first of all of the middle row of the upper molars, which rubs against the inner and outer side respectively of the outer and inner row of the opposing tooth. Compared with the types of "*Tripriodon cœlatus*"[1] and "*caperatus*"[2], *Dipriodon robustus* shows its inner cusps unproportionally extending outwards, and this would justify the supposition that the remnants of two cusps of the middle row have united with what remains of the enamel-folds of the two inner cusps, a mode of coalescence which we often see realized in worn molars. I therefore fail to find in Marsh's previous publications the proofs of the statement made by him[3] that one series of upper molar teeth of Cretaceous Allotheria has but two rows; although from certain analogies—with the molars of *Mus* on the one side, those of *Cricetodon* on the other—analogies which may hereafter turn out to be homologies, I am quite willing to admit that Prof. Marsh may have in his hands the means for proving it. I cannot admit Osborn to have satisfactorily shown that in this group of Cretaceous Allotheria there are lower molars with three rows of cusps. If there were three rows of cusps with two longitudinal grooves in the lower molars, we would have to urge four rows of cusps with three longitudinal grooves in the upper molars; these have not been forthcoming up to the present date. Thus there seems to be no reason for denying Marsh's statement that "the lower molars .... although differing widely in the form and structure of their crowns, have only two parallel series of crescents or tubercles, an outer and inner row, with a groove or valley between them"[4].

For my present purpose it may be sufficient to point out, that both authors agree in stating that there are several forms with upper molars composed of three longitudinal rows of cusps with two grooves between them, to which correspond two longitudinal rows with one groove in the lower molars; but, as stated before, they have not furnished sufficient proof for their opinion that these molars belong to an aberrant Order of Mammalia. In comparing the teeth in question with those of the Muridæ and more particularly of *Mus*, it becomes evident that the main differences between them consist in this, that whilst in the Cretaceous molars the prevailing division is effected by longitudinal grooves, in *Mus*, on the contrary, the molars are deeply divided by transverse grooves: the longitudinal grooves in this genus, of which there are two in the upper, and one in the lower molars, being relatively shallow. For further particulars on this argument, as far as it relates to Muridæ, I refer the reader to a paper by Hensel on *Mus orthodon* from the Ossiferous Breccias

[1] *L. c.* part I. pl. ii. figs. 19, 20.
[2] *L. c.* part III. pl. v. fig. 2.
[3] *L. c.* part III. p. 253.
[4] *Ib.* p. 253.

of Sardinia[1], and to a subsequent paper by myself on the same subject[2].

Marsh has recently made the following statement:—"One fact is becoming more and more evident, the near affinity of the early Primates, Carnivores, Ungulates, and Rodents, with each other and with the Insectivores, and more remotely with Marsupials. The key to the mystery lies concealed in the great break between the Lower Wahsatch, at the base of the Eocene as now known, and the Laramie beds of the Cretaceous. In the latter, none of the above placental mammals have been found, but in the early Eocene occur, side by side, Carnivores, Rodents, and Ungulates ..."[3]

I have endeavoured to show that the key to the mystery actually lies for the chief part in Prof. Marsh's own hand, and I trust that he himself will before long furnish us with the full proofs that several at least of the Cretaceous Allotheria, so called, are in the direct ancestral line of Eutheria.

And, in the meanwhile, I confidently state as follows my conclusions as to the primitive type of the Eutherian molar:—

(1) The primitive condition of the Eutherian molar is that of polybuny.

(2) The single tubercles or cusps were arranged in longitudinal series (*Tinotaxis*), divided by longitudinal grooves or valleys, there being generally three rows with two grooves in the upper, and two rows with one groove in the lower molars.

(3) *Microlestes* may prove to be a remote ancestor of the Eutheria.

[1] R. Hensel, "Beiträge zur Kenntniss fossiler Säugethiere.—II. Ueberreste von *Mus* in der Breccie von Cagliari," Zeitschr. d. deutsch. geolog. Gesellschaft, viii. Band, 1856, p. 281. The conformation of the first upper molar of *Mus* is described by Hensel as follows:—"Seine Krone zerfällt durch zwei fast bis auf den Grund der Krone eindringende Querfurchen in drei Querleisten, von welchen die beiden ersten nach vorn convex, nach hinten zu concav erscheinen ... Zwei verhältnissmässig seichte Längsfurchen zertheilen wiederum jede Querleiste in drei mehr oder weniger deutliche Höcker ... Das Schema für die Backenzähne des Unterkiefers (Fig. 11*b*) ist ein wesentlich anderes. Zwar sind auch hier die Kronen durch zwei Querfurchen in drei Querleisten getheilt. Allein statt zweier Längsfurchen findet sich nur eine, so dass jede Querleiste in zwei Höcker, die ganze Zahnkrone also in sechs derselben zerfällt." (*L. c.* p. 282.)

[2] Forsyth Major, "Sulla conformazione dei Molari nel Genere *Mus*, e sul *Mus meridionalis* e *Mus orthodon*, Hensel," Atti Soc. Tosc. Sc. Nat. Proc. Verb. 1888, pp. 129–145.—Mr. Oldfield Thomas has lately drawn my attention to his "Description of a new Genus and Species of Rat from New Guinea," the *Chiruromys forbesi* (Proc. Zool. Soc., April 17, 1888, pp. 237–240, fig. 2, p. 239). In this paper it is stated that the teeth of *Chiruromys* "are remarkably complicated, and show a high degree of specialization, far more than is found in any other genus at all allied to the present one," and that "this extreme specialization both of teeth and tail is especially remarkable in an animal inhabiting such a refuge for old and little-modified forms as New Guinea." From what I have been saying, it is to be inferred, that the teeth in question, far from showing a high degree of specialization, are, on the contrary, of a very generalized type, precisely such as we might anticipate to meet with in a refuge for old and little-modified forms.

[3] O. C. Marsh, "A new Order of extinct Eocene Mammals (Mesodactyla)," in American Journal of Science, vol. xlii. May, 1892, p. 449.

(4) From the polybunous molar, as characterized before, have been derived the other types of Placental molars, by a gradual transformation of the longitudinal arrangement of cusps into a transverse one (*Chiastotaxis*), and by a prevailing development of a few cusps—a sort of Oligarchy—as well as by the fusion and suppression of others, several of which are, however, maintained with great persistency in a secondary condition.

(5) In the upper molars two outer cusps and one or two inner cusps are usually the most developed.

(6) The truly tritubercular molar is but a very specialized stage, which is often preceded, *not followed*, by Rütimeyer's trigonodont type.

(7) The supposition that the so-called *heel* or *talon* of inferior molars is a later development, is an arbitrary one, disproved by facts.

(8) Which of all the cusps of the primitive polybunous molar or its derivatives may be "homologous with the reptilian cone," I do not know.

VI. EXPLANATION OF THE PLATES.

Plate VIII.

Right superior molars, much magnified, of:—

Fig. 1. *Sciurus (Eosciurus) indicus*, Erxl. m_1. (B.M. 1203 *a*.)
2. *Sc. prevosti*, Desm. m_1. (B.M. 5836.)
3. *Sc. lokroides*, Hodgs. m_1. (B.M. 1868/4 . 4.3.)
4. *Sc. everetti*, Thos. m_2. (B.M. 1892/9 . 6.8.)
5. *Xerus (Euxerus) hosei*, Thos. p_1. (B.M. 1892/7 . 19.2.)
6. *Xerus (Euxerus) insignis*, Fr. Cuv. m_1. (B.M. 68 *c*.)
7. *Xerus (Protoxerus) stangeri*, Waterh. m_1. (B.M. 515 C.)
8. *Xerus (Protoxerus) aubinnii*, Gr. m_1. (B.M. 1875/4 . 30.4.)
9. *Xerus (Atlantoxerus) getulus*, Gesn. m_2.
10. *Xerus erythopus*, Geoff. m_2. (B.M. 1888/11 . 4.4.)
11. *Xerus (Euxerus) laticaudatus*, Gr. m_1. (B.M. 1885/8 . 1.272.)
12. " " p_1. "
13. *Anomalurus fraseri*, Waterh. p_1. (B.M. 555 *c*.) "
14. *Anomalurus beecrofti*, Fras. m_1. (B.M. 1066 *b*. 1886/1 . 5.1.)
15. *Xerus (Paraxerus) pyrropus*, Fr. Cuv. m_1. (B.M. 897 *a*.)
16. *Xerus (Euxerus) berdmorei*, Bly. (juv.) m_1. (B.M. 1878/6 . 17.51.)
17. " " (middle age). m_1. (B.M. 1878/6 . 17.33.)
18. " " (old). m_1. (B.M. 1861/4 . 12.13.)
19. *Pteromys leucogenys*, Temm. m_1. (B.M. 556 *b*.)
20. *Sciuropterus pearsoni*, Gr. m_2. (B.M. 1883 *a*.)
21. *Sciuropterus horsfieldi*, Waterh., type. m_1. (B.M. 1855/12 . 24.102.)
22. *Xerus (Paraxerus) cepapi*, Smith. m_1. (B.M. 1885/12 . 8.2.)
23. *Xerus (Paraxerus) pyrropus anerythrus*, Thos. m_1. (B.M. 1890/6. 8.22.)
24. *Xerus (Paraxerus) isabella*, Gr. m_2. (B.M. 1862/5 . 9.3.) Cameroons.

Plate IX.

Right inferior molars, much magnified, of:—

Fig. 1. *Sciurus (Eosciurus) indicus*, Erxl. m_1.
2. *Rhithrosciurus macrotis*, Gr. m_1. (B.M. 1888/8 . 13.7.)
3. *Sciurus lokroides*, Hodgs. m_1.
4. *Sciurus everetti*, Thos. m_2.

Fig. 5. *Xerus* (*Eoxerus*) *hosei*, Thos. p_4.
6. *Xerus* (*Eoxerus*) *insignis*, Fr. Cuv. m_1.
7. *Xerus* (*Protoxerus*) *stangeri*, Waterh. m_1.
8. *Xerus* (*Protoxerus*) *aubinnii*, Gr. m_1.
9. *Xerus* (*Atlantoxerus*) *getulus*, Gesn. m_2.
10. *Xerus erythopus*, Geoff. m_2.
11. *Xerus* (*Eoxerus*) *laticaudatus*, Gr. p_4.
12. ,, ,, m_1.
13. *Anomalurus fraseri*, Waterh. p_4.
14. *Anomalurus beecrofti*, Fras. m_1.
15. *Xerus* (*Paraxerus*) *pyrropus*, Fr. Cuv. m_1.
16. *Xerus* (*Eoxerus*) *berdmorei*, Bly., juv. m_1.
17. ,, ,, middle age. m_1.
18. ,, ,, old. m_1.
19. *Pteromys leucogenys*, Temm. m_1.
20. *Sciuropterus pearsoni*, Gr. m_2.
21. *Sciuropterus horsfieldi*, Waterh., type. m_1.
22. *Xerus* (*Paraxerus*) *pyrropus anerythrus*, Thos. m_1.
23. *Xerus* (*Paraxerus*) *cepapi*, Smith. m_1.
24. *Xerus* (*Paraxerus*) *isabella*, Gr. m_2.

Plate X.

Fig. 1. *Sciuropterus albanensis*, n. sp. (Middle Miocene of Grive-Saint-Alban.) Upper incisor. *a*, from the outer, *b*, from the inner, *c*, from the anterior side.
2. *Xerus* (*Eoxerus*) *grivensis*, n. sp. (Middle Miocene of Grive-Saint-Alban.) Left mandibular ramus, nat size.
3. m_1, m_2, m_3, of the same; magn. $\frac{6}{7}$.
4. *Sciurus spermophilinus*, Dep. p_4, m_1, m_2 sup. sin.; magn. $\frac{6}{7}$.
5. ,, ,, Anterior view of inf. incisor; magn.
6. ,, ,, Left mandibular ramus, inner view, nat. size.
7. ,, ,, Left mandibular ramus, outer view, nat. size.
8. ,, ,, p_4, m_1, m_2, m_3, inf. sin., upper view; magn. $\frac{6}{7}$.
9. ,, ,, The same as fig. 8, inner view; magn. $\frac{6}{7}$.
10. *Nannosciurus concinnus*, Thos. (Isabella, Basilan, Philippines), type. (B.M. 1940 *a*. 1876/10.4.7.) d_4, m_1, m_2, m_3, inf. sin.; magn. $\frac{6}{7}$.

Plate XI.

Fig. 1. *Sciuropterus tephromelas*, Günth. Malay Peninsula. (B.M. 1885/8.1.126.) Left mandibular ramus. Nat. size. From the inner side.
2. The same. m_3; magn. $\frac{3}{2}$.
3. *Sciuropterus albanensis*, n. sp. (Middle Miocene of Grive-Saint-Alban.) Left mandibular ramus, from the inner side; nat. size.
4. The same from the outer side; nat. size.
5. The grinding-teeth of the same, upper view; magn. $\frac{4}{1}$.
6. *Nannosciurus minutus*, Du Chaillu. W. Africa. (B.M. 1794 *a*. 1861/7.29.19.) Superior grinding-teeth of the right side (p_4, m_1, m_2, m_3); magn. $\frac{6}{1}$.
7. *Nannosciurus concinnus*, Thos., juv. Superior grinding-teeth of the right side (d_4, m_1, m_2, m_3); magn. $\frac{6}{1}$.

2. Observations on the Development of the Rostrum in the Cetacean Genus *Mesoplodon*, with Remarks on some of the Species. By Henry O. Forbes, F.Z.S., F.R.G.S.

[Received January 17, 1893.]

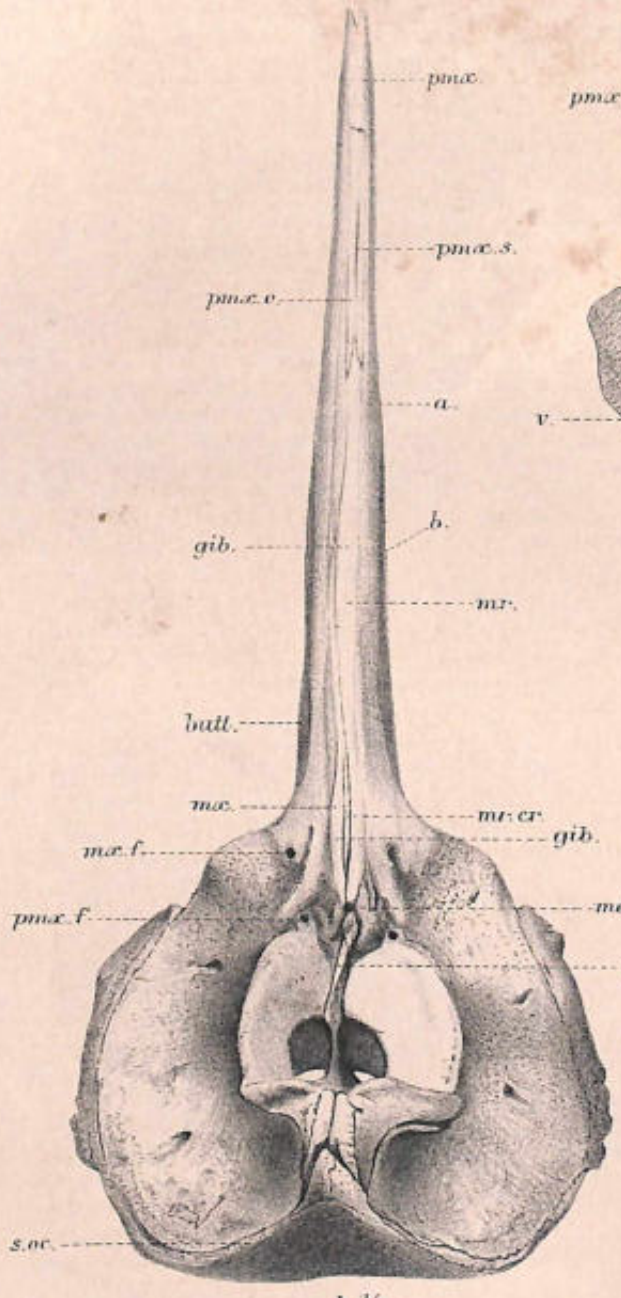
(Plates XII.–XV.)

In the course of my duties as Curator of the Canterbury Museum, Christchurch, N. Z., I had occasion to study the Cetacea in that collection. In my determination of the species of *Mesoplodon* I was necessarily guided by the authoritative papers on this group by Sir William Flower in the 'Transactions' of this Society, and by Sir William Turner in his Report on the Cetacea of the 'Challenger' Expedition. In his paper in volume x. of our 'Transactions,' page 422, Sir William Flower observes, in speaking of a form near to *Mesoplodon grayi*, Haast:—"Making every allowance for individual variation, it scarcely seems possible that a rostrum such as that shown in figure 2 [i. e. *Mesoplodon grayi*: Plate XIV. fig. 3] could change in the course of growth to that in figure 3 [i. e. *Mesoplodon haasti*, Flower: Plate XII. fig. 2]. If so, most of the determinations of the fossil species based solely on the form of the rostrum are quite valueless." The same author, on an earlier page (page 420) of the same paper, remarks:—"There is still much to be learned with regard to the mode of ossification of this cartilage. All the specimens which I have had an opportunity of examining are either so young that ossification has not commenced, and the trough of the vomer in the rostrum proper is completely empty in the dried skull, or so old that the consolidation of the cartilage and its union with the surrounding bone has been completed." In having lived for some time in the region in which this genus is not uncommon, I have been fortunate in having had an opportunity of examining several immature crania in which the relations of the bones which constitute the rostrum were such as to enable me to trace some unobserved stages in their development. These observations I have thought of sufficient interest to lay before the Society, especially as they bear on some of the characters by which the various forms of *Mesoplodon* and *Ziphius*, both recent and fossil, have been separated from each other.

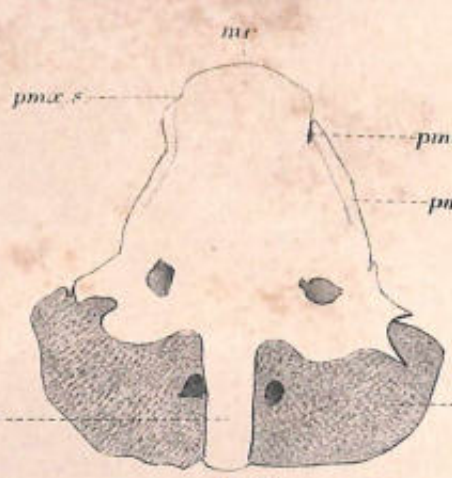
The deductions I have arrived at in this paper are based on a personal examination and comparison of the following specimens:—

A. A very young (and, according to Haast, a male) skull, with its mandible,—one of three specimens sent from the Chatham Islands to Sir Julius von Haast in 1875. It is a co-type of *Mesoplodon* (*Oulodon*) *grayi*, Haast, described in vol. ix. of the 'Transactions' of the N.Z. Institute. In this specimen the vomerine trough is quite empty. It forms part of the collection in the Otago Museum, Dunedin, N.Z.

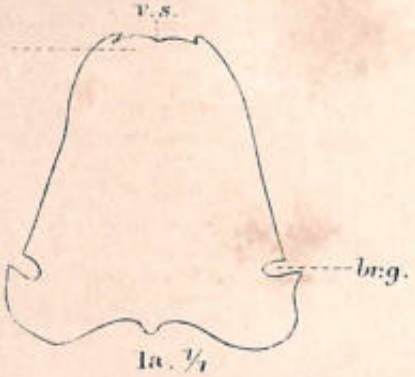
A*a*. A young specimen in the Otago Museum, Dunedin, in



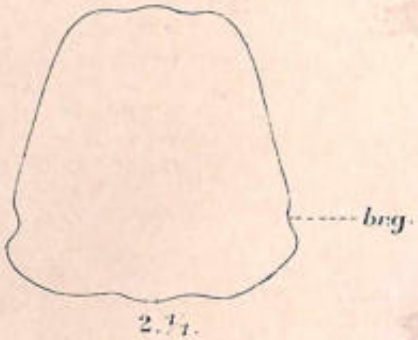
1. 1/3.



1b. 1/1.



1a. 1/1

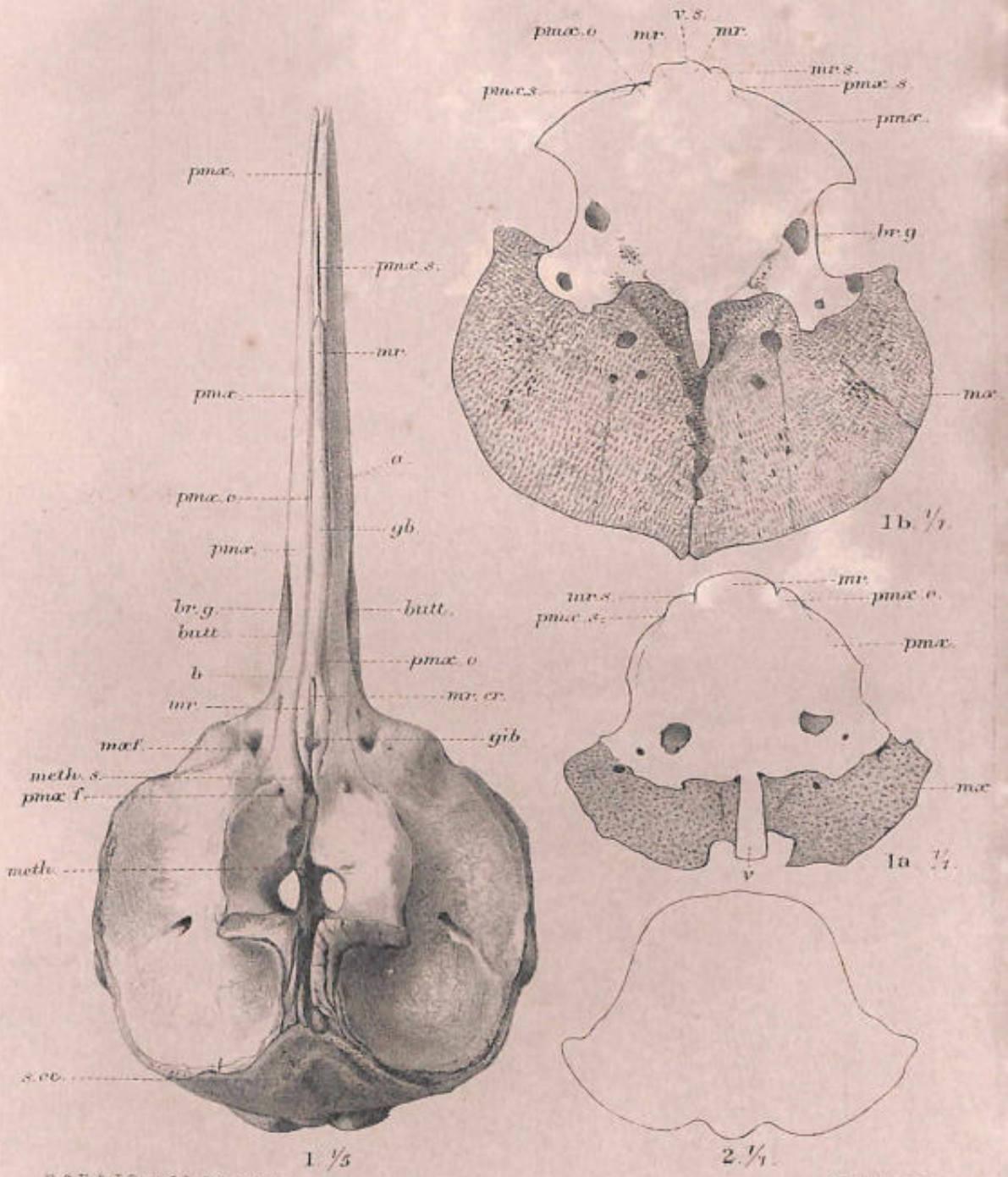


2. 1/1.

H. G. F. & J. Smit del. J. Smit lith.

Mintern Bros. imp.

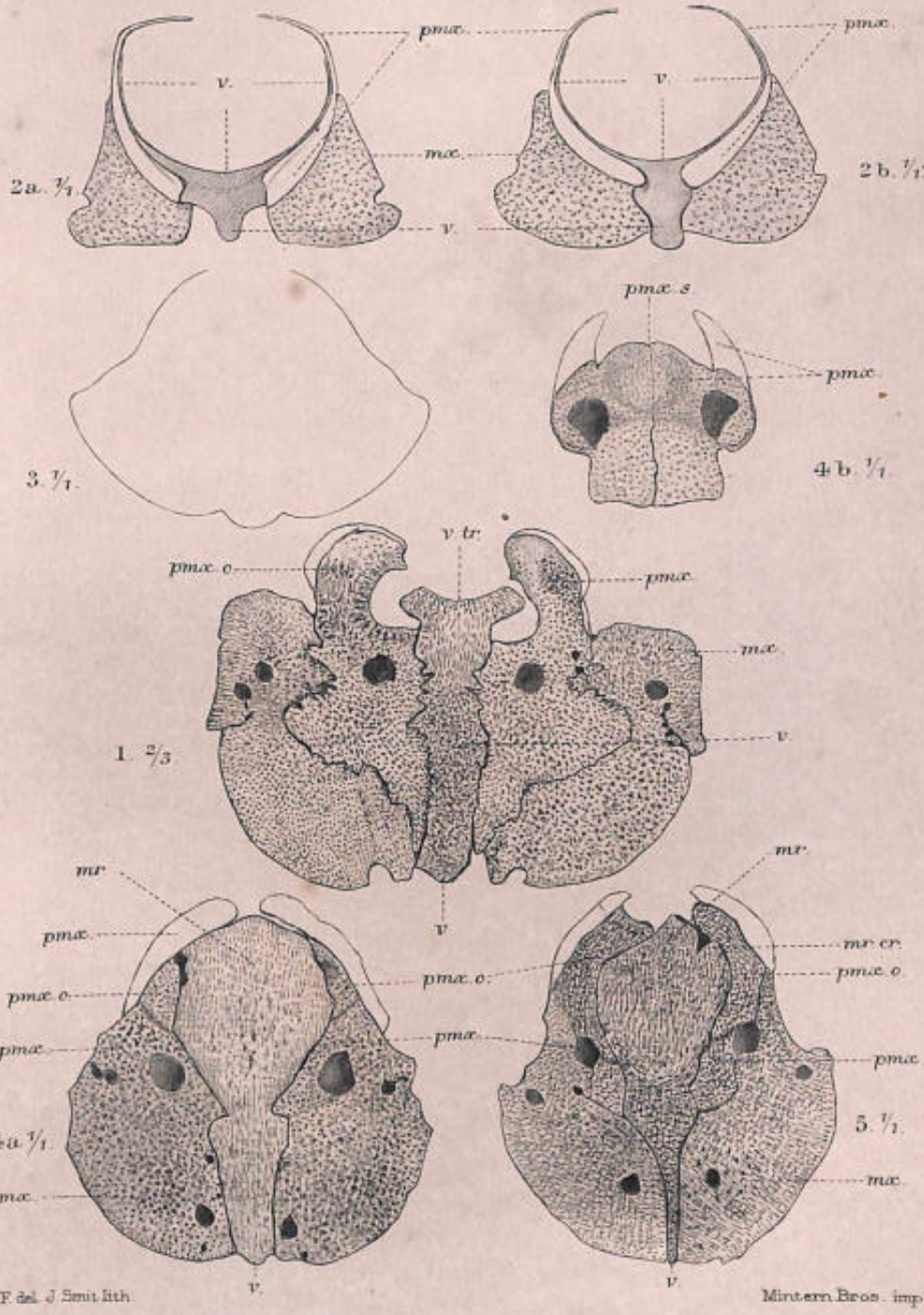
STRUCTURE OF MESOPLODON.



H. O. F. & J. Smit. del. J. Smit. lith.

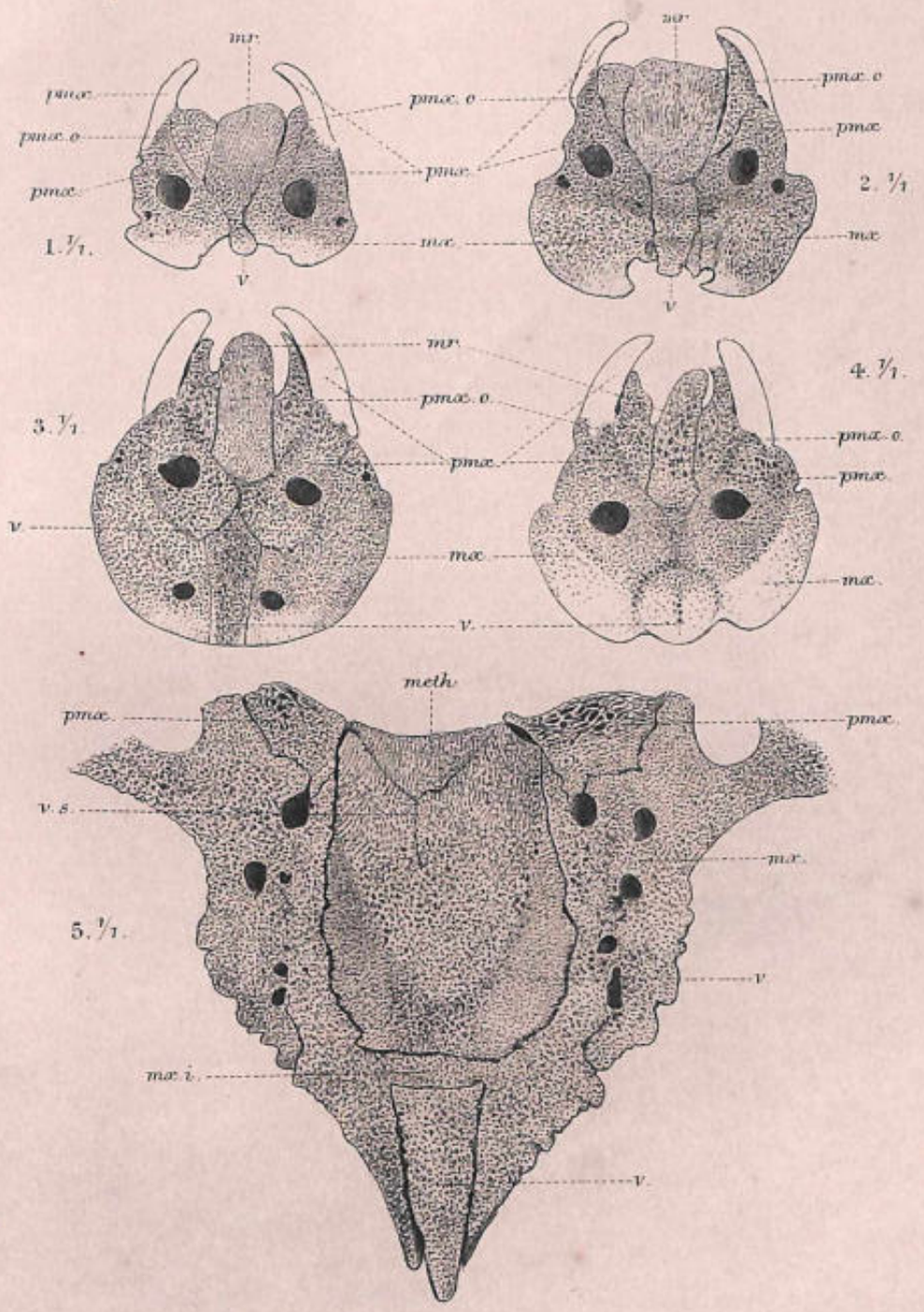
Mintern Bros. imp.

STRUCTURE OF MESOPLODON.



H. O. F. del. J. Smit. lith. Mintern Bros. imp.

STRUCTURE OF MESOPLODON.



J. Smit del. et lith.

Mintern Bros. imp.

STRUCTURE OF MESOPLODON.

which the first appearance of change in the mesorostral groove is visible.

B. A damaged cranium, without its mandible, received from the Chatham Islands, and now exhibited; of unknown sex, and of a more advanced age than A. The vomerine trough is still empty and perfectly smooth. It would appear to be about the same age, being apparently about the same stage of development, as *Mesoplodon grayi*, Haast, figured by Van Beneden and Gervais in their 'Ostéographie des Cétacés.'

C. A skeleton in the Museum of the Royal College of Surgeons—that described and figured by Sir W. Flower as *M. grayi*, Haast, in his paper already cited. This is the second of the two Salt Water Creek skeletons prepared by Sir J. von Haast, and determined by him to be *Oulodon grayi*. Its sex is doubtful; but it is still quite young, as the interior of the vomerine spout (so far as unconcealed by the rostral integument on the anterior part of the snout and of the dried cartilage in the canal) is still smooth and free from ossification.

D. The rostrum of a specimen obtained for me from the Chatham Islands, and now exhibited. I have no doubt it belongs to the species *Mesoplodon grayi*, Haast. Its sex is unknown, but its age is somewhat greater than any of those already mentioned. The vomerine trough is partially filled with osseous tissue.

E. The rostrum of a third specimen from the Chatham Islands, and now on the table, of unknown sex and of a still more advanced age, but still immature. This specimen, along with B, D, and G, will be presented to the British Museum.

F. A skull, with its mandible, of an immature (according to Haast, female) specimen of *Mesoplodon* (*Oulodon*) *grayi*, Haast. This is the second of the three skulls described by him in the ninth volume of the 'Transactions' of the New Zealand Institute from the Chatham Islands, and now in the Otago Museum, Dunedin, N. Z. It is also a co-type of the genus and species *Oulodon grayi*.

G. The rostrum of a cranium obtained for me from the Chatham Islands. It is still immature, as the mesorostral furrow, though nearly full of ossified tissue, is not yet quite filled up, and the whole of the bones are still spongy. It belongs undoubtedly to the species *grayi*, Haast, of this genus.

H. A complete female skeleton of *Mesoplodon* (*Oulodon*) *grayi*, Haast, one of four individuals that in December 1876 ran on the beach near Salt Water Creek, north of Banks Peninsula, N. Z. It was identified and described as the co-type of *Oulodon grayi* by Sir J. von Haast. Of these four specimens two skeletons were prepared—one (C) being sent to the Royal College of Surgeons, London, and the present specimen retained in the Canterbury Museum, where it is now. Though described by Sir J. von Haast as "a full-grown animal," it still bears marks of immaturity in its incompletely filled-up vomerine spout and in the rostral bones exhibiting none of that petrosal density so characteristic of fully adult *Mesoplodonta*.

I. An aged skull, without the mandible (probably a male), from Kaiapoi beach, Canterbury, N. Z., labelled, under direction evidently of Sir J. von Haast, as *Mesoplodon knoxi*, Hector, and by another hand changed into *Mesoplodon hectori*, Gray. This is the specimen referred to by Sir James Hector, in the 'Transactions' of the N. Zealand Institute, vol. v. page 168, as being in the Canterbury Museum from Kaiapoi "without the lower jaw," which he considered the adult form of his young *Mesoplodon knoxi*. It appears also, with little doubt, to be the same specimen of which Sir J. von Haast, in volume ix. of the same publication, page 455, makes the following observation, which in the absence of the mandible I am at a loss to understand, as it seems to be and to have been, the only specimen from Kaiapoi, or of *M. hectori*, in the Museum :—"I wish to add that a comparison of these three skulls of *Oulodon* [A, F, I] with the skull of *Mesoplodon hectori*, Gray [= *M. knoxi*, Hector] in the Canterbury Museum, and which is derived from an aged specimen, shows at a glance the distinct specific character [*i. e.* teeth at the symphysis of the mandible], besides being much smaller in all its proportions."

The Canterbury Museum specimen, as will be seen from fig. 1, Plate XIII., differs from *Mesoplodon hectori*, Gray, as figured in Sir W. Flower's paper (Tr. Z. S. vol. x. pl. lxxi. fig. 4).

J. The skeleton of an adult from Lyall Bay, N. Z., in the British Museum, described and figured by Sir W. Flower, in volume x. of the Society's 'Transactions,' as *Mesoplodon australis*. It is probably of the male sex.

K. A mutilated skull, with its mandible, of an aged male *Mesoplodon* (*Oulodon*) *grayi*, Haast. This is the remaining one of the three Chatham Island crania referred to under specimen A. It is the type specimen of the genus and species, and is the individual figured by Von Haast in the 'Transactions' of the N. Z. Institute, vol. ix. plate xxvi. fig. 3 (not fig. 1, as erroneously marked on that plate). Along with its two companions (A and F) it had remained in the same condition as found and figured in 1875, enveloped in its integuments, till all three were partly dissected and partly macerated out by me in July 1890.

L. The specimen described and figured by Sir William Flower in the paper so often referred to, under the name of *Mesoplodon haasti*. This is an old—even aged—individual, nearly of the same age, in my opinion, as K. It is undoubtedly a male, and is now in the collection of the Royal College of Surgeons, London.

With these specimens I have compared the published descriptions of *Mesoplodon* (*Oulodon*) *grayi*, Haast, given by Van Beneden and Gervais on plate lxii. of their 'Ostéographie.'

All the above 13 specimens belong without any doubt to *Mesoplodon grayi*, Haast; indeed no fewer than six of them were recognized by Sir Julius von Haast as belonging to the species which he had himself established.

M. The skeleton of an aged male of *Mesoplodon layardi* in the Canterbury Museum, N. Z.—labelled *M. floweri*, Haast.

N. A cranium of an immature example of *M. layardi* in the Wellington Museum, N. Z.; sex unknown.

O. A cranium of a young individual of *M. layardi*, in the Napier Athenæum, N. Z., in which the vomerine trough is quite empty and smooth; sex unknown.

P. A cranium of an aged individual in the British Museum, evidently a male.

Q. For purposes of comparison with the species of *Mesoplodon*, I have examined the skeletons of *Ziphius cavirostris* (=*Epiodon chathamensis*) in the Canterbury Museum, N. Z.

R. A cranium of a very young individual of *Ziphius cavirostris*, collected by myself in the Chatham Islands in January last (1892), and now in the Canterbury Museum, in which the vomerine spout is quite empty and smooth, except on the bottom of the trough, where there is a small upgrowth.

S. A skeleton of *Ziphius* (*Epiodon*) *chathamensis* (=*Z. cavirostris*) in the British Museum collection.

T. A cranium of *Ziphius cavirostris* (the type) in the British Museum.

U. A younger cranium than T, of *Ziphius cavirostris*, in the same collection.

V. A skeleton and two crania of *Berardius arnuxii*, in the Canterbury Museum, N. Z.

With these I have also compared the various fossil species in the Geological Department of the British Museum, *Mesoplodon angustus*, *M. gibbus*, *Choneziphius planirostris*, and *C. planus*.

For the opportunity of examining one or more of the above enumerated specimens I am greatly indebted to the kindness of Dr. Günther, F.R.S., and Dr. Woodward, F.R.S., of the British Museum; to Professor Stewart, P.L.S., Royal College of Surgeons, Prof. T. J. Parker, F.R.S., Dunedin, N. Z., Sir James Hector, F.R.S., Wellington, N. Z., and to the authorities of the Hawke's Bay Philosophical Society in Napier, N. Z.

From an examination of these specimens I have come to the conclusion that the species of *Mesoplodon*, and certainly some of *Ziphius*, change very greatly in regard to the form of their rostra with age and sex; and from the transverse sections of various rostra that I exhibit it will be apparent that the contour of each varies with the amount of ossification and consolidation of the rostral bones in different sexes at different ages. It will then be seen, I think, that the species designated *Mesoplodon hectori*, Gray, by Hector and Haast, and *Mesoplodon australis* and *Mesoplodon haasti* by Sir W. Flower, are really more or less aged forms of *Mesoplodon grayi*, Haast. In his paper in the 'Transactions' of the Zoological Society already referred to, Sir W. Flower has been careful to remark:—"Under the circumstances it is somewhat difficult to know what course to pursue with reference to the names by which these specimens are to be respectively distinguished; but on the whole it will lead to less confusion if I designate them, provisionally at least, by specific appellations, bearing in mind that it

is quite possible that further information and more abundant materials may cause a modification of this view"[1].

Sir William Turner, in his paper on *Ziphius cavirostris* and *Mesoplodon sowerbyi*, in the Trans. R. S. Edinburgh, vol. xxvi. p. 768, says:—"In my description I have named the dense solid bar in the middle of the beak the mesorostral bone. This bar corresponds with the 'vomer' of Cuvier, Gervais, and Gray, with the 'anterior tuberosity of the vomer' of Fischer, with the 'continuation of the pre-frontals forward to near the end of the premaxillaries' of Owen, and with the 'anterior prolongation of the ethmoid' of Flower. Whatever name be applied to it, there can be no doubt that it is an ossification of the anterior end of the long cartilaginous bar, which in the Cetacea is prolonged forwards to the end of the beak, and in relation to the sides and lower surface of which the spout-like vomer is formed." And Sir William Flower, in the paper I have already quoted from, continues:—"But it must be observed that, although the cartilage appears to be nothing more than a continuation forwards of the ordinary mesethmoid lamina or septum of the nose, the ossification is not a simple extension forwards of that which occurs in all Cetacea (in all Mammalia, in fact) in the hinder or internarial portion of the septum, but appears to be an independent production, peculiar to the genera *Mesoplodon*, *Ziphius*, and certain allied extinct forms. It is separated by an interval (which appears to diminish with age, but of which traces can be seen on the upper surface of the rostrum near its base) from the true mesethmoid ossification. It differs from the latter in being intensely hard and compact, whereas the mesethmoid is, especially at its anterior part, somewhat spongy in texture. It differs also in showing strong indications of being formed by a pair of lateral ossifications, united in the middle line, as the upper surface in many parts and the anterior apex show a marked median groove. I think it will be well therefore to adopt Prof. Turner's name of 'mesorostral' bone for this solid bar forming the centre of the rostrum, restricting mesethmoid to the part lying between the nares and a short distance in front of them, which is ossified in the young animal and in all other species of Cetacea"[2].

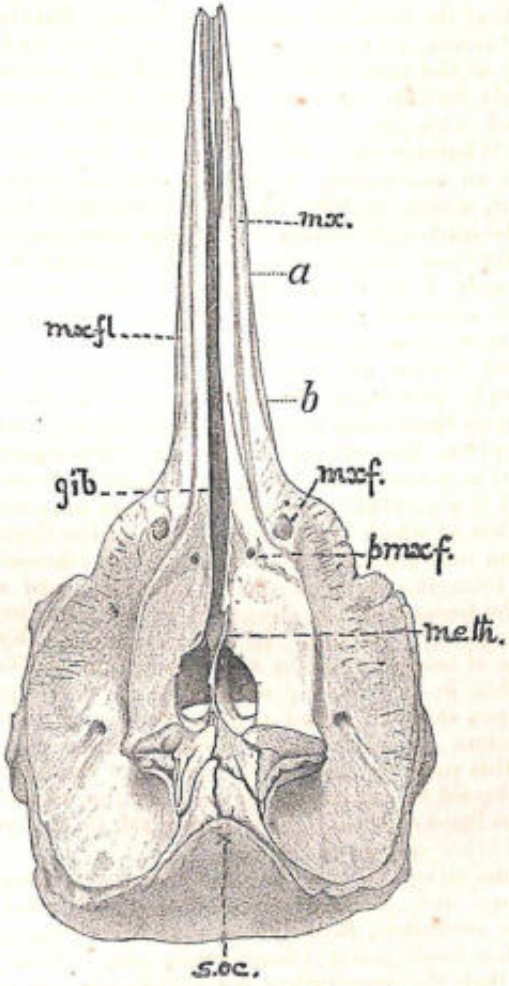
An examination of the sections of young specimens of *Mesoplodon grayi* and *M. layardi* in the light of what takes place in *Ziphius cavirostris*, *Berardius arnuxii*, and *Clymenia*, and perhaps in the fossil genus *Choneziphius*, will, I think, show satisfactorily that the mesorostral consolidation is not an ossification of the mesorhinal or mesorostral cartilage, but is an upgrowth in the rostral trough, formed by a proliferation of the osseous tissue of that part of the vomer itself, and perhaps partly of the premaxillaries, at all events not an ossification of the mesorostral cartilage pure and simple, as occurs in *Clymenia* and *Berardius*.

Before discussing the question of species, I shall trace from

[1] Tr. Z. S. vol. x. p. 419.

[2] Tr. Z. S. vol. x. p. 420.

Fig. 1.



Upper surface (one fourth the natural size) of the cranium of a very young specimen (A in the list, p. 216) of *Mesoplodon grayi*, Haast.

Sections of this rostrum at *a* and *b* are represented on Plate XIV. figs. 2 *a*, 2 *b* respectively.

mxf. and *pmxf.*, the maxillary and premaxillary foramina; *gib.*, gibbosity of the premaxillaries; *s.oc.*, supraoccipital; *mxfl.*, maxillary flange; *meth.*, mesethmoid; *mx.*, maxillary bone.

their earliest appearance the changes that take place in the rostral bones.

Commencing with the youngest specimen I have yet examined, that lettered A above (see fig. 1, p. 221), sections of the rostrum taken at 11, $6\frac{1}{2}$, and $5\frac{1}{2}$ inches from its apex show the following appearances:— The vomer appears in the most posterior section (*i. e.* in that at 11 inches) as a more or less uniform semicylindric spout, with a thick rounded keel, whose sides thin upwards and articulate with a diverticulum of the maxillary (as seen in *Clymenia*, and more markedly in *Physeter*) and the sides of the premaxillaries. The premaxillaries are roughly rectangular plates dropped into the maxillaries, and they partly roof-in the trough, their sides entering into the formation of the rostral groove. In the middle section the upward arms of the vomer become smaller; the spout is still floored by the vomer, but its wings are very thin and their walls blend to form a continuous smooth surface with those of the premaxillaries, whose sides also are very thin and stand somewhat more erect (Plate XIV. fig. 2 *b*). On the outside the premaxillaries articulate with the maxillaries. Still more anteriorly (Plate XIV. fig. 2 *a*) there is a slight change in the form of the vomerine keel, and the premaxillaries appear on the palatal surface, and prevent any articulation between the maxillaries and the vomer. The vomerine trough in the macerated skeleton is quite empty and very smooth, and in the recent state it is filled with cartilage. The mesethmoid only just enters the posterior end of the groove, between the wings of the vomer.

The next older specimen (B) I take to be of greater age than that of the skeleton in the Royal College of Surgeons, figured by Sir William Flower, and about equal (judging alone by the figure, plate lxii., in his 'Ostéographie') to that of Van Beneden's specimen. Its examination showed how much the premaxillaries, and especially the maxillaries and the vomer in its basal region, had grown in massiveness, and with this growth the form of the vomerine canal had become narrowed. I have unfortunately seen only one specimen of *Mesoplodon* (a specimen in the Otago Museum, A*a*) in which the very beginnings of the change are present. In this young specimen there was an elevation in the mid-line of the bottom of the groove, but the vomerine trough was otherwise in no way different in shape and smoothness from that of the young forms already described. The form and thickness of the premaxillaries and their general contour were characteristic of the undeformed ziphioid snout. In a specimen of a very young cranium of *Ziphius cavirostris* (*Epiodon chathamensis*, Hector), which I was fortunate enough, during my visit to the Chatham Islands, to examine, changes had occurred in the rostrum very similar to those which take place in the genus *Mesoplodon*, but of a more pronounced character. If we follow the changes in *Ziphius* they will, I think, help to explain those that occur in *Mesoplodon*. The section (Plate XIV. fig. 1) taken from the specimen in the Canterbury Museum, "a very old female" according to Von Haast (Tr. N. Z. I. vol. ix. p. 430), will show

more clearly than words that there has taken place a very great increase in the maxillaries and in the premaxillaries, which latter also (as in the young *M. grayi* just alluded to) come down and appear on the palatal surface of the rostrum, intervening between the vomer and the maxillaries. The vomer, it will be seen, has lost all its usual form by being squeezed; the trough is only indicated by a small depression between its two thickened arms (Plate XIV. fig. 1, *v.tr*). In the British Museum specimen of the same species, of which there is a complete skeleton, the vomer is in its upper aspect a sharp, triangular, ridged bar, very like that in *Mesoplodon angulatus*, one of the fossil forms from the Red Crag. There is an enormous thickening of the premaxillaries, as well as of the vomer. In the older specimens in which the great prenasal fossa is seen, the vomer forms the bottom of the fossa and the mesethmoid disappears. Into how extraordinary a feature this eventually grows up in the aged individual is well illustrated by the two crania in the British Museum collection. The species originally described by Sir James Hector as *Epiodon chathamensis* has now been united by Sir W. Turner to *Z. cavirostris*, a determination acquiesced in by Hector. The differences exhibited by the Chatham Island specimen and the other two crania in the British Museum are so very marked that it appears difficult for me to conceive how one form can ever grow into the other. If the identification be correct, and I have no reason to question it, it will be found that only in the one sex—probably the male—does this enormous development of the vomer take place, accompanied or preceded by the formation of the great prenasal cavity, from which the species derives its name. In New Zealand both forms occur; and I have examined specimens in which this prenasal cavity was already deep, but which were younger (*cf.* Tr. N. Z. I. vol. v. pl. iv.) than either of the specimens in the British or the Canterbury Museums, as indicated by the less advanced stage of the vomerine upgrowth. Sir W. Turner has remarked on the abrupt manner in which the posterior end of the mesorostral bone terminates and on the smoothness of the cavity. This is observable in all the New Zealand forms, and the appearance suggests that, through some cause or other, absorption takes place, or disease attacks these bones in the male and not in the female.

It is to be noted that in many of the specimens of this species the accretion of material and the change of form are confined to the vomer, as is seen in the Canterbury Museum specimen and in that figured by Van Beneden—at least for some considerable time there is no deposit of osseous tissue in the premaxillary portion of the spout, to which the cartilage also extends. If the filling-up of this trough were the result of ossification alone of the rostral cartilage, it would proceed, it seems to me, uniformly over the whole surface of the trough. If we examine also, in connection with this, the anterior prolongation of the ethmoid as it occurs in *Berardius arnuxii*, it may be observed that the ossification proceeds in quite a different

manner; it takes place inside the cartilage, and must, if it were to coalesce with the vomer and premaxillaries, grow downwards. In *Clymenia* the ossification in the ethmoidal cartilage takes place in the same way, from above downwards, so that it is apparent that in *Mesoplodon* the ossification of the rostral elements proceeds differently. They may obtain material from the mesorostral cartilage for a time, but at all events when the vomerine element has extended above the level of the premaxillaries the cartilage must have become too attenuated to be able to provide any longer the material necessary for such a mass of bone as is developed in the British Museum specimen of *Z. cavirostris*, in which the resulting mesorostral bone is far greater in all dimensions than the original cartilage. Sir W. Flower remarks[1] that this "ossification has not hitherto been found wanting in any thoroughly adult example of any species of *Mesoplodon* or *Ziphius*; on the other hand, it appears never to occur either in *Hyperoodon* or *Berardius*." This I have found to be true, for in the *Berardius arnuxii* which I brought from the Chatham Islands there is an unusually long mesorostral ossification extending to nearly three fourths of the length of the snout; but it is not an ossification[2] of the same character as that in *Mesoplodon*, though *Mesoplodon* and *Berardius* have such close affinities. The fossilization of such a specimen of *Berardius* as this might perhaps result in a form like *Choneziphius*[3], in which the ossification has apparently proceeded, as in *Berardius*, from above downwards.

To return to *Mesoplodon grayi*, it will be seen from the sections (Plate XV. figs. 1, 2, 4, *v*) that the premaxillaries, by growing in upon the keel of the vomer, have induced a considerable thickening in that region. It is not improbable that this pressure is the cause of the proliferation of the osseous tissue in other parts of the vomer. In some cases the maxillary ingrowth also in this region actually cuts the bone into two parts, leaving its lower portion,—that emerging as a bar on the palatal surface between the pterygoids,—as a loose fragment kept in place by the maxillaries (Plate XV. fig. 5, *mx.i* & *v*).

In the section it may be seen how shallow and compressed the outline of the original trough has become; that the sides of the premaxillaries are no longer horizontal, but perpendicular. The fragment (*meth*) seen in Plate XV. fig. 5, fitting into a depression in the vomerine groove, is exceedingly interesting. It represents the ossified anterior prolongation of the mesethmoid. It is complete in its anterior termination, it has never extended

[1] *L. c.* p. 419.

[2] It is an ossification of the ethmoidal cartilage.

[3] In describing *Choneziphius packardi* (Quart. Journ. Geol. Soc. xxvi. (1870) p. 503), Prof. Ray Lankester says:—"Below and posteriorly to this most anterior part of the rostrum is a cavity $\frac{3}{4}$ of an inch in diameter, extending axially to the rostrum (pl. xxxiii. figs. 1 & 3, *v. c.*), the remains of the primitive trough-like cavity of the vomer, as Prof. Huxley calls it in describing *Belemnoziphius*." This appears to me to imply that the ossification had been proceeding from above downwards at the time of the death of *C. packardi*.

further, and moreover it is not ossified to the other bones, and, as a matter of fact, it remains for a long time separate. It may become one with the mesorostral bone in very aged animals; even then the suture remains generally very distinct, wedged in between the upgrowths of the mesorostral.

A section of the same snout (Plate XV. fig. 3) taken more anteriorly is also of great interest, for there the thickening and ingrowth of the premaxillary bones are seen to bisect the vomer into two parts just below the spout; the growth of premaxillary ossifications (*pmx.o*) on both sides has compressed and folded together in the middle the vomerine walls, thickened already by proliferation of their tissue, the point of union being with some care observable in the median line.

In a still more anterior section (Plate XV. fig. 4, *v*) the keel portion of the vomer below the bisection has increased in growth and appears as a round rod, part of which shows on the palatal surface, and has begun to become implicated in the ivory-like ossification which has commenced.

In the Chatham Island specimen and in that in the Otago Museum (G and F respectively in above list) much the same changes occur. In some cases, as, for instance, in the female specimen (H in the above list) in the Canterbury Museum, the filling-up of the vomerine spout has proceeded more symmetrically, and we have then greater regularity in the form of the section of the snout (Plate XIV. fig. 4, *a*). Fig. 1 *b*, Plate XII., represents a section through the middle of the snout of the type (male) specimen of *M. grayi* in the Canterbury Museum, and how widely it differs from that of the female of the same species in the same Museum (Plate XIV. fig. 4 *a*) or of *M. australis* in the British Museum (Plate XIII. fig. 2) is at once apparent—yet not greater than the difference between the three forms of *Mesoplodon layardi* shown in the sections *a*, *b*, *c*, fig. 2, p. 228. Fig. 2, Plate XII., is a reproduction of the section of *M. haasti* from Sir W. Flower's paper in the Trans. Zool. Soc., so often referred to, and which, as he has pointed out, differs so much from the section of any other he has examined that he could not include it in any known species; while fig. 1 *a*, Plate XII., is a section made by me of the type specimen of *M. grayi* in the Canterbury Museum, somewhat more anterior than fig. 1 *b*, but still in the region where the vomer appears on the palatal surface, and their similarity will be at once admitted.

I have already quoted Sir W. Flower's remark that if so great a change can take place, due to individual variation, as exists between *M. grayi* and *M. haasti*, then most of the fossil species based solely on the form of the rostrum are quite valueless. If we take, for instance, the two forms *M. angulatus* and *M. medilineatus*, there exists far less difference between them than between some of the forms of *M. grayi* or of *M. layardi*.

The median lines or sutures on the surface of the mesorostral bone, which vary so much, and also the gibbosities of the premaxillaries, are, after studying the sections of immature forms,

easy of explanation. The gibbosities, it will be observed, occur n the rostrum over those regions where the vomer does not reach the palatal surface. The removal of the wedge gives more space beneath, causing the premaxillaries to gape, while more anteriorly, in front of the place where the vomer vanishes, the premaxillaries stand still more apart. In the regions where the edges of the premaxillaries are closest the vomer is wedged in on the palatal surface between the bases of the maxillaries, and there the rostral bone, as a rule, grows densest and protrudes furthest above the level of the premaxillaries, and just there often shows no median line or suture. In the male *Z. cavirostris* the greatest growth of the mesorostral occurs where not only the vomer, but also the lower edges of the premaxillaries, protrude on the palatal surface.

The lines or sutures on the surface of the mesorostral are produced by various causes, sometimes (as in the specimen, Plate XIII. figs. 1, 1 *a*, *v.s*) by the two wings of the vomer meeting in the centre [1], when the suture may persist or may become lost, according to the amount of squeezing the mesorostral undergoes. Then on each side of the solidified vomer may appear the sutures of the premaxillaries (Plate XIII. fig. 1 *a*, *pmx.s*), and very often the thickenings of the interior surface of the premaxillaries (*pmx.o*) grow up between and shoot above the original petrous walls of these bones, forming another suture, so that there may be as many as five lines traceable on the surface. There may be more if, as sometimes occurs, one of these segments becomes crumpled (Plate XIII. fig. 1, Plate XIV. fig. 5, *mr.cr*) in the general squeeze of the parts. Hence, as diagnostic characters (cf. *M. medilineatus*), the lines on the mesorostral bone are also quite valueless. In the most anterior part of the rostrum there is only one median suture (*pmx.s*), often very well marked, especially in old individuals, where the osseous growths on the interior surfaces of the premaxillaries meet. As has been pointed out both by Sir W. Flower and Sir W. Turner, a suture, or often a deep depression, between the mesethmoid and the mesorostral is generally visible (Plate XII. fig. 1, Plate XIII. fig. 1, *meth.s*).

On comparing the different specimens which I have had an opportunity of examining personally, or by their various published descriptions, the species of the genus *Mesoplodon* seem to me to be reducible to six :—

1. Mesoplodon bidens (Sowerby).

Cf. Flower, Trans. Zool. Soc. x. p. 415 (1878).

2. Mesoplodon europæus (Gervais).

Cf. Flower, Trans. Zool. Soc. x. p. 416 (1878).

[1] "It seems probable (as Duvernoy has already pointed out) that the 'central area' indicates the upper extent of the vomer, the only remains of the primitive trough-like cavity being the median slit above and the large fossa behind."—*Huxley*, Quart. Journ. Geol. Soc. vol. xx. p. 394 (1864).

3. Mesoplodon hectori (Gray).

Berardius arnuxii, Hector, Trans. N. Z. I. ii. p. 27 (1870).
Smaller Ziphioid Whale, Knox & Hector, Trans. N. Z. I. iii. p. 125, pls. xiii.–xv. (1871).
Berardius hectori, Gray, Ann. & Mag. Nat. Hist. ser. 4, vol. viii. p. 117 (1871).
Mesoplodon knoxi, Hector, Trans. N. Z. I. vol. v. p. 167 (1873).
Mesoplodon hectori, Turner, Trans. R. Soc. Edin. vol. xxvi. p. 778 (1872); Flower, Trans. Zool. Soc. vol. x. p. 416 (1878).

Since Sir William Flower's memoir on the genus *Mesoplodon*, no further information has been obtained as to this species, which differs so markedly from the others occurring in the same region, in the absence of a basirostral groove and in the position and form of its mandibular tooth.

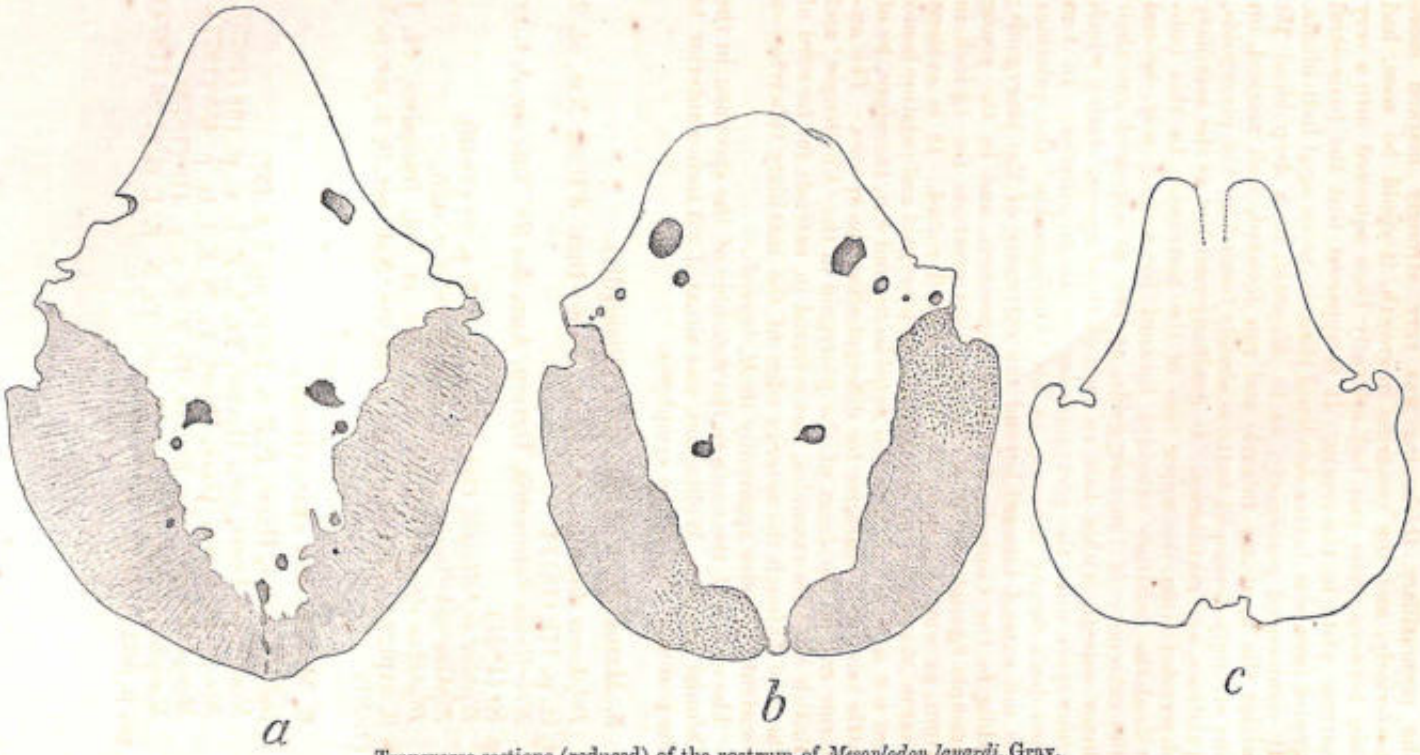
The Kaiapoi specimen (I in the list, p. 218) (Plate XIII. fig. 1) in the Canterbury Museum, which bears the MS. name of *M. hectori* (and has been referred to by Hector as *M. hectori*), is undoubtedly at once distinguishable from this species by the presence of a most distinct basirostral groove. In this paper therefore I have placed it under *M. grayi*. It is just possible that the cranium and the mandible of *M. hectori*, Gray, figured by Sir W. Flower, may not belong to each other.

4. Mesoplodon layardi (Gray).

Ziphius layardi, Gray, P. Z. S. 1865, p. 358; Owen, Crag Cet. p. 12, pl. i. (1870).
Ziphius (Dolichodon) layardi, Gray, Cat. Seals & Whales B. M. p. 353 (1866).
Dolichodon layardii, Hector, Trans. N. Z. I. vol. v. p. 166, pl. iii. (1872).
Mesoplodon longirostris, Krefft, MS.; *M. guentheri*, Krefft, MS.
Calliodon guentheri, Gray, Ann. & Mag. Nat. Hist. ser. 4, vol. vii. p. 368 (1871).
Dolichodon traversii, Gray, Trans. N. Z. I. vol. vi. p. 96 (1874).
Mesoplodon floweri, Haast, P. Z. S. 1876, p. 478; id. Trans. N. Z. I. vol. ix. p. 442 (1877).
Mesoplodon güntheri, Turner, Trans. R. Soc. Edin. vol. xxvi. p. 778.

I exhibit a figure of the transverse section *c* (see fig. 2, p. 228) of a specimen in the Wellington Museum, N.Z., whose age was not quite mature (its rostrum, from the maxillary foramen, measured 2 feet 3¼ inches), in comparison with an example (fig. 1 *b*) in the Canterbury Museum, and another (fig. 1 *a*) figured in the 'Challenger' Reports by Sir W. Turner. The Wellington specimen was in rather a poor condition, being considerably water-worn, and having lost by accident part of the mesorostral ossification. The anterior part of the rostral trough was still empty, though presenting a slight increase in the floor of the premaxillaries;

Fig. 2.



Transverse sections (reduced) of the rostrum of *Mesoplodon layardi*, Gray.

a, after a figure by Sir W. Turner in his 'Report on the Cetacea of the 'Challenger' Expedition'; *b*, from a male specimen in the Canterbury Museum, N.Z.; and *c*, from a not quite adult example in the Colonial Museum, Wellington, N.Z. (slightly diagrammatic).

the premaxillary thickening was very strongly marked more posteriorly, and the vomerine upgrowth, it could be seen, had lain between them and had evidently been squeezed into a very narrow plate in the centre. It is apparent that the basirostral groove here was better developed than in more aged individuals. It commenced posteriorly, as in *M. grayi*, in a deep blind pit under the maxillary tubercle and ran forward, well marked, on the strongly-developed buttress already formed by the pterygoids, palatines, and maxillaries. It gradually vanished as the maxillary descended from the upper face of the rostrum. In this individual the palatines extended forward for a long way beyond the extremity of the pterygoids, as well as appeared on their inner side to within half an inch of their apices, during which short space only the pterygoids lay on the maxillaries. In Van Beneden's figure, however, in his 'Ostéographie,' the palatines do not extend forward beyond the extremity of the pterygoids; while in the Canterbury Museum specimen, and in the young example figured by Sir W. Turner, they protrude for $1\frac{5}{8}$ inch in front, as well as extend beyond them all round. It is evident that in *Mesoplodon* the relations of the pterygoid and palatine bones are not so constant as in the *Delphinidæ*, and can, therefore, be of little value as a character for differentiating the species. The anterior end of the fossa of the pterygoid in the 'Challenger' and British Museum examples, just referred to, extends far forward of the line through the anterior edge of the maxillary tubercles—a constant character apparently in *M. layardi*.

The centre of the tooth in the mandible of the specimen in the Colonial Museum, Wellington, was situated 2·3 inches anterior to the posterior edge of the symphysis.

5. MESOPLODON DENSIROSTRIS (Blainville).

Delphinus densirostris, Blainv. Nouv. Dict. d'Hist. Nat. éd. 2, t. ix. p. 178 (1817).
Mesodiodon densirostris, Duvern. Ann. des Sc. Nat. sér. 3, t. xv. p. 59 (1851).
Ziphius sechellensis, Gray, Zool. E. & T. p. 28 (1846).
Ziphius sechellensis, Krefft, P. Z. S. 1870, p. 426.
Diplodon densirostris, Gervais, Zool. et Pal. françaises, éd. 1, t. ii. expl. no. 40 (1850); Ann. des Sc. Nat. sér. 3, t. xiv. p. 16 (1850).

6. MESOPLODON GRAYI (Haast).

Oulodon grayi, Haast, P. Z. S. 1876, pp. 7 & 457.
Mesoplodon knoxi, juv., Hector, Tr. N. Z. I. v. p. 168 (1873).
Mesoplodon hectori, Gray, Haast, Tr. N. Z. I. ix. p. 455 (1877).
Mesoplodon australis, Flower, Tr. Z. S. x. p. 419 (1878).
Mesoplodon hectori, Gray, Hector, Tr. N. Z. I. vi. p. 86 (1874); vii. p. 362 (1875).

Mesoplodon haasti, Flower, Tr. Z. S. x. p. 419 (1878).
Oulodon grayi, Haast, Van Beneden & Gervais, Ostéog. des Cét. p. 516, pl. lxii.

In examining the list of specimens of this species which I have enumerated above, they fall into three groups:—(1) The young forms in which the mesorostral groove is empty (A, A*a*, B); (2) those in which the groove is solidly filled up with porcellaneous ossification (I, J, K, L); and (3) the intermediate forms, in which what will become the mesorostral bone of Turner is in younger or more advanced stages of growth (C, D, E, F, G, H),—of these G and H are approaching maturity.

The table on the opposite page gives the principal dimensions of all the more complete specimens measured by me which I attribute to *Mesoplodon grayi*, Haast.

On comparing these measurements and the photographs of the crania which I exhibit, it is impossible not to be struck with the similarity of their general outlines—*Mesoplodon haasti* (L) with the type (K); *M. australis* (Flower) (J) with the Kaiapoi skull (I); and the skull from the skeleton of the co-type in the Canterbury Museum (H) with Van Beneden's figure of *M. grayi*, Haast. The skull of the younger Otago Museum specimen (A) graduates through the Chatham Island form (D) to the somewhat older representative in the Museum of the Royal College of Surgeons (C). The known female forms have more gracefully attenuated rostra, the males wanting in this respect somewhat owing to a greater development of the buttress formed by the maxillaries, palatines, and pterygoids. The female rostra are also longer than those of the males, as the measurements show where the sexes have been determined.

Seen from above.

The form of the rostrum may be observed (fig. 1, p. 221) in the younger specimens to be wider at the base and less slender throughout its length than in individuals of greater age. The maxillary tubercle has a more sloping and less acute-angled shoulder, and the maxillary bones (*mx*) are wider, and form, as they emerge on the rostrum, a more prominent flange (or upper border) to the basirostral groove on each side, than in older specimens. They run forward on the sides of the rostrum (well seen in Van Beneden's figure of *M. grayi*) along the premaxillaries as broad bands, one on each side, narrowing and descending towards the inferior surface as they proceed, while with the increasing age of the animal they become narrower and shorter on the sides of the rostrum, thus reducing the length and prominence of the basirostral grooves through the disappearance of their superior flanges. The inferior flanges of the groove are more prominent than the superior, extending in A for 1½ inch more anteriorly than the superior. In the younger forms the supraoccipital (*s.oc*) is wide and flat behind, and its apex in the vertex expands more ante-

	Mesoplodon grayi, Haast. Otago Mus. (A). ♂.	*M. grayi*, Haast. Paris Mus. (Van Ben.) Sex?	*M. grayi*, Haast R. Coll. Surg. (C). Sex?	*M. grayi*, Haast. Otago Mus. (F). ♀ (Haast).	*M. grayi*, Haast. Cantb Mus. (H). ♀.	*M. grayi*, Haast. Cantb. Mus. (K). ♂. (Type.)	*M. grayi*, Haast. *australis*, Fl. B. M. (J)? ♂.	*M. grayi*, Haast. Cantb. Mus. (I)? ♂.	*M. grayi*, Haast. *haasti*, Fl. R. Coll. Surg (L). ♂.
Extreme length of cranium	[18·60[1]]	26·60	30·30	[35·40[1]]	36·25	[34·00[1]]	30·30	30·30	
Length of rostrum from apex of premaxilla to middle of a line drawn between anteorbital notches	12·75	17·20	20·20	24·70	25·25	23·05	19·90	20·45	23·10
From middle of hinder edge of palate (formed by pterygoids) to apex of rostrum	13·75	19·20	24·50	26·30	26·85	23·40	23·80	21·00	
Greatest height of cranium from vertex to pterygoids	8·90	10·00	10·40	?10·25[2]	?10·75[2]	11·10	11·00	?10·75[2]	
Breadth of cranium across middle of superior margin of orbits	8·45	9·00	10·50	11·25	11·75	11·25	11·20	11·25	11·20
Breadth of cranium between zygomatic processes of squamosals	8·95	10·40	11·10	11·85	12·00	12·00	11·70	12·00	
Breadth of cranium between anteorbital notches	5·75	7·00	7·20	7·00	7·50	7·50	7·40	7·40	7·50
Breadth of middle of rostrum	1·75	1·20–1·40	1·60	1·65–1·75	1·90–2·50	1·90	1·70	1·95	1·80–1·20
„ occipital condyles	.....	3·30	3·70	.....	4·10	.....	3·90	4·35	
Premaxillæ, greatest width behind anterior nares	4·20	5·00	5·10	5·15	5·95	4·75	5·40	5·15	
Premaxillæ, least width opposite anterior nares	3·65	3·80	4·00	4·35	4·45	4·20	4·40	4·55	
Premaxillæ, greatest width in front of anterior nares	3·90	4·20	4·40	4·50	4·80	4·80	4·60	4·75	
Width through maxillary foramina	5·25	6·00	6·80	6·85	7·10	6·60	7·00	6·50	6·80
Width of narrowest part of crest	2·00	1·30	1·22	1·40	2·25	1·75	1·40	1·50	
From crest of occipital to anterior end of pmx. crest	2·05	.....	2·60	3·00	3·00	2·95	2·80	3·30	
Width of anterior nares	1·70	1·80	2·10	1·95	2·10	2·10	2·00	2·00	
Length of tympanic bone	2·00	2·10	2·00	2·05	.....	2·75	1·90	.....	
Greatest breadth of tympanic bone	1·25	1·10	1·40	1·30	.....	1·30	1·30	.....	
Mandible, length of ramus	18·66	23·80	26·00	30·80	32·20	29·75	.....	.....	
„ length of symphysis	4·55	8·20	8·40	11·30	13·00	10·25	.....	.....	
„ greatest vertical height of ramus	3·55	4·00	4·10	4·40	5·10	4·35	.....	.....	
Centre of tooth from apex of mandible	4·55	8·20	7·60	10·50	10·90	10·20[3]	.....	.....	9·60

[1] Calculated. [2] Slightly broken. [3] Apex of tooth eccentric.

riorly. In A a line drawn through the *meatus auditorius* at right angles to the length of the rostrum transects it posteriorly to its crest, while in older specimens such a line falls anterior to the supraoccipito-frontal suture. The crest of the vertex is wider, and the bones which meet there (the nasals, frontals, supraoccipitals, maxillaries, and premaxillaries) articulate very loosely with each other. In the youngest form I have examined the nasals lie vertically between the ends of the premaxillaries, the right nasal being on, and the left beneath their level in the vertex; but as these whales advance in age the nasals sink more deeply between the crest of the premaxillaries, and with the frontals are tightly squeezed together between the premaxillary, maxillary, and supraoccipital bones. The nasal ends of the premaxillaries are less vertical, lower and less everted, and the asymmetry between their right and left portions in the younger individuals is but slightly marked, the right side, however, being always a little larger than the left. The inner borders of the maxillaries are parallel, presenting a gibbosity (*cf.* fig. 1, *gib*) opposite and extending anteriorly to the maxillary foramina. These gibbosities, which become more marked with age, are but slightly observable in Van Beneden's figure and in A, are already more prominent in the Royal College of Surgeons example, and still more so in the intermediate specimens. As I have remarked above, they occur over the intervals in which the vomer does not show on the palatal surface. The premaxillary foramina lie behind those of the maxillary, as usual in this species, and are situated—the right $\frac{1}{2}$ inch and the left $\frac{1}{4}$ of an inch—*anterior* to a line joining the anteorbital notches, and also anterior to the forward termination of the ethmoid bone. A line drawn thus in the Kaiapoi specimen (I) runs obliquely *between* the two pairs of foramina, but nearer to the premaxillary foramina than in the type. In the Canterbury Museum example (H) it touches the posterior margins of the right maxillary foramen, and the two pairs are situated nearer than in the type (which closely resembles Flower's *haasti* in this respect) or in the Kaiapoi specimen, being in the case of the nearest ·25 inch distant (as they are unsymmetrical, the right one of the two is slightly farther apart); in the type they are 1·90 and in the Kaiapoi specimen 1·25 inch apart. In the Royal College of Surgeons example of *M. grayi* such a line passes midway between the pairs, while in Flower's *M. australis* it traverses the left premaxillary foramen and comes very near the anterior margin of the right. In the older Otago Museum specimen (F) the right maxillary foramen is $\frac{1}{10}$ inch more posterior to the line than the left, and the pairs are distant, the right $1\frac{9}{10}$ inch and the left $1\frac{1}{2}$ inch. It is evident, therefore, that during growth there is a movement of the maxillaries and premaxillaries upon each other, which may not improbably have something to do with originating the proliferation of osseous tissue in the premaxillaries and vomer. In full-grown specimens these foramina are posterior to such a line and are more nearly opposite the anterior termination of the mesethmoid. The floor and sides of the mesorostral

groove in the three specimens of the younger group are in their greater extent formed by the spout-shaped vomer, by a diverticulum of the maxillary bone (which appears superiorly for a short distance opposite the premaxillary foramina between the vomer and the premaxillary laminæ), and by the premaxillaries. As the vomer terminates at 3 inches from the tip of the rostrum, the anterior portion of the spout is entirely formed by the premaxillaries. The empty vomerine trough (in the macerated skeleton) shows no signs of the cartilage, which occupied it in the living state, having been attached at any point to any of the bones, except the anterior termination of the ethmoid, which is rough as is usual.

In the previous part of this paper I have shown by sections what takes place in group 2; how, probably by the vigorous growth of the maxillary and premaxillary bones surrounding the vomer, a slight upgrowth, as a ridge-like elevation, appears in the bottom of the vomerine trough, and a thickening of the sides of the interior walls of the premaxillaries takes place, which gradually increases and eventually fills up the mesorostral groove. Where the gibbosities occur, over the regions where the vomer does not protrude on the palatal surface, this growth has more space and better resists the pressure, while in those parts where the premaxillaries approach closer together, the increasing vomerine growth indicates by its varied contortions the effect of the strains to which it has been subjected. The form, therefore, that the rostrum may eventually assume in the mature animal varies with the difference in the strains it undergoes, through the different rate of growth in the surrounding bones, and in the individual's vitality, sex, and age. The various sutures and lines which are seen on the surface of the solidified rostrum of aged crania have already also been explained.

In none of the three specimens of group 1 has the buttress (formed by the maxillaries, palatines, and pterygoids) extended sufficiently far forward or become prominent enough to appear externally to the flanges of the basirostral groove. In the oldest specimen I have examined, that from Kaiapoi (I) (Plate XIII. fig. 1), the buttress and the lower margin of the basirostral groove are very prominent, and resemble closely *M. australis* of Flower, which is also an adolescent individual. On comparing the whole series, it is to be seen that the younger the age, the less anteriorly does the buttress extend, and the less prominent are both it and the inferior flange of the basirostral groove.

Seen from the side.

The boundaries of the basimaxillary groove are formed by flanges of the maxillary. Their disposition as seen from the upperside has already been described. In the young specimen (A) (fig. 1, p. 221) in the Otago Museum and in Van Beneden's figure, the maxillaries run along the side of the rostrum, in the former to within 2·5 inches, and in the latter to within 3·5 inches of the apex; indeed, in the latter it appears to be, at 7 inches from the tip, still $\frac{1}{5}$ of an

inch wide (measured on the upper surface). In the older specimen (F) in the Otago Museum the maxillary ceases at 7·65 inches, and in the type (K) at $9\frac{1}{4}$ inches from the apex of the rostrum, so that the groove practically ceases there. The lower flange of this groove is generally traceable on the side of the rostrum much more clearly than the upper, and in older specimens is very pronounced at the base of the rostrum, decreasing in prominence as it runs forward, especially in the Kaiapoi specimen (I) and in *M. australis*, Flower. The depth of the groove and of its subtubercular pit, and the divergence of its flanges, appear to vary with age and sex, and would seem to be dependent on the individual growth of the bones in the neighbourhood, especially the increase forward of the palatines and pterygoids. In those forms in which the buttress is strongly developed, a shallow depression or groove separates the lower flange from the maxillo-pterygoid swelling.

Seen from the palatal surface.

From this aspect the relations of the palatine and pterygoid bones in the two Otago Museum specimens (A, F), in the three Canterbury Museum examples (H, I, K), and in *M. grayi* of Flower's paper in the Society's Transactions are identically the same. The palatines lie on the outside of the pterygoids, reaching forward as far as but not extending beyond their pointed ends; the pterygoids, therefore, articulate directly with the maxillaries. In the *M. (Oulodon) grayi* figured by Van Beneden the palatine bones completely surround the anterior ends of the pterygoids and extend anteriorly to them, preventing their coming into contact with the maxillaries. The same differences exist between the specimen in the Canterbury Museum of *Ziphius cavirostris*, in which the palatine bones surround the pterygoids, and the figure on plate xxi. *bis* in the 'Ostéographie' of Van Beneden, in which they do not. The same differences were also pointed out above in my remarks on specimens of *M. layardi*, and are therefore due solely to individual variation.

The relations of the premaxillaries, maxillaries, and vomer on this aspect of the cranium are the same in all these specimens, the amount which each contributes varying with the age, sex, or individual.

The number of teeth in the gum of the upper jaw in the examples I macerated, in one case exceeded by one, in the second case was less by one, and in the third equalled that given by Sir Julius von Haast in describing the type species.

The triangular pterygoid in all these examples has the usual everted lower border and deep fossa, as also the deep notch at the base of the pterygoid plate, and presents no essential feature by which the species can be separated one from another. The pterygoid fossæ in the three specimens I dissected contained each a large air-sac opening into the ear-cavity, and communicating with the mouth by the Eustachian passage. In *M. grayi* the pterygoid fossa never extends anterior to the level of the maxillary tubercle.

In the youngest Otago specimen the tympanic bone was $1\frac{3}{8}$ inch in length and 1 inch in breadth at its posterior end, and the older $1\frac{3}{4}\frac{8}{0}$ inch in length by $1\frac{1}{8}$ in width, where it is divided by a deep groove, as in the species of *M. grayi* described by Sir W. Flower and Sir J. von Haast. Except for a slight difference in size these bones are almost indistinguishable in the different specimens in which they are present.

Mandible.

The table of measurements, p. 231, gives the data by which the mandible of the specimen A (the young Otago specimen) may be compared with that in the Museum of the Royal College of Surgeons specimen and with Van Beneden's figure—all immature; with that of F, the older example in the Otago Museum, H, the Canterbury Museum female, and the type K and other fully adult specimens. The teeth in the mandible of A are half opposite, half behind the posterior end of the symphysis. In the specimen H, the centre of the teeth is 2·1 inches anterior to the hinder end of the symphysis; in F it is 10·4 inches from the tip of the mandible, and ·80 inch in front of the hinder end of the symphysis, while their posterior margins are well anterior to the same point. The teeth are erect, equiangular, and slope outward, with the apex slightly incurved. The socket is large enough to allow of a slight play of the tooth in it. The dentary groove bulges out on both sides opposite the tooth from $\frac{7}{2}\frac{}{0}$—$\frac{1}{2}\frac{1}{0}$ inch. In the type K the centres of the teeth are opposite to the posterior end of the symphysis.

Summary.

The above observations have, I think, shown that in the genus *Mesoplodon* the mesorostral bone is formed, not at all events by the sole and direct ossification of the mesorostral cartilage, but in great part by a proliferation of the osseous tissue in the floor and sides of the vomer, and in the walls of the premaxillaries, caused probably by the compression of these bones, as a result of the vigorous growth that seems to arise at an early age in the maxillary and premaxillary bones surrounding them, and originated perhaps also by the movement upon each other of the maxillaries and premaxillaries; that the form assumed by the rostrum when viewed in section varies very greatly with the age and sex of the individual; and that the outline of a transverse section of the rostrum can no longer be considered as a character for separating the species of the genus. It becomes necessary also to unite, ss I have done in this paper, the forms described under the names of *Mesoplodon australis*, Flower, *M. haasti*, Flower, *M. hectori*, Gray (of Hector, but not of Flower), under the same species *M. grayi*, Haast. It follows also that a great number of the Crag fossils of the genus *Mesoplodon* must be united together as forms of one species, of different sexes and ages.

EXPLANATION OF THE PLATES.

PLATE XII.

Fig. 1. Upper surface of cranium of *Mesoplodon grayi*, Haast, type, ½ nat. size.
1*a* & 1*b*. Transverse sections of the rostrum of the same at *a* and *b* respectively, nat. size.
2. Outline transverse section of *M. haasti*, Flower, after Flower, for comparison with the sections 1*a* and 1*b*, nat. size.

PLATE XIII.

Fig. 1. Upper surface of cranium of *Mesoplodon grayi*, Haast—the Kaiapoi skull (I), ½ nat. size.
1*a* & 1*b*. Transverse sections of the rostrum of the same at *a* and *b* respectively, nat. size.
2. Outline transverse section of *M. australis*, Flower, after Flower, for comparison with the sections 1*a* and 1*b*, nat. size.

PLATE XIV.

Fig. 1. Transverse section of rostrum of *Ziphius cavirostris*, ♀.
2*a* & 2*b*. Transverse sections of the rostrum of a young individual of *Mesoplodon grayi*, Haast. *Cf.* fig. 1, page 221.
3. Outline transverse section of the rostrum of *M. grayi*, Haast, in the R. Coll. Surgeons, after Flower.
4*a* & 4*b*. Transverse sections of the rostrum of *M. grayi*, Haast, ♀, in Canterbury Mus., Christchurch, N.Z.
5. Transverse section of the rostrum of *M. grayi*, Haast, ♀, in the Otago Univ. Museum, N.Z.

Fig. 1 is ⅔ nat. size; figs. 2–5 nat. size.

PLATE XV.

Figs. 1, 2. Transverse sections of *Mesoplodon grayi*, Haast—Specimen E in list above, from the Chatham Islands, nat. size.
3–5. Transverse sections of *M. grayi*, Haast—G in the list above, from the Chatham Islands; fig. 4 is the most anterior and 5 the most posterior section, and all are of the nat. size.

EXPLANATION OF ABBREVIATIONS.

br.g. Basirostral groove.
butt. Maxillary buttress.
gib. Gibbosity.
mr. Mesorostral bone.
mr.s. ,, suture.
mr.cr. ,, crease.
mx. Maxillary bone.
mx.f. ,, foramen.
mx.i. ,, ingrowth.
meth. Mesethmoid bone.
meth.s. Anterior termination of mesethmoid bone.
pmx. Premaxillary bone.
pmx.s. ,, suture.
pmx.o. ,, ossification.
pmx.f. ,, foramen.
s.oc. Supraoccipital bone.
v. Vomer.
v.s. Vomerine suture.
v.tr. ,, trough.

March 14, 1893.

Sir W. H. Flower, K.C.B., LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of February 1893:—

The total number of registered additions to the Society's Menagerie during the month of February was 73, of which 43 were by presentation, 6 by birth, 10 by purchase, 10 received in exchange, and 4 on deposit. The total number of departures during the same period, by death and removals, was 91.

Amongst the additions attention may be called to two Terrapins procured at Okinawa Shima, or Great Loochoo Island, by Mr. P. A. Holst, and kindly presented by that gentleman. Mr. Holst writes that Dr. L. Döderlein has stated in a paper read before the Asiatic Society that he could find no Tortoises whatever on the Loochoo Islands. Mr. Holst has therefore forwarded these specimens in order to show that Tortoises are certainly found there.

Mr. Boulenger has kindly determined these Tortoises as being Spengler's Terrapin, *Nicoria spengleri* (Boul., Cat. of Chelonians, 1889, p. 120).

Mr. Oldfield Thomas exhibited a specimen of what he believed to be *Nanotragus livingstonianus*, Kirk, which had been obtained by Mr. A. H. Neumann in Northern Zululand in April 1892. The species had only previously been known from a very imperfect scalp and skull obtained by Sir John Kirk at Shupanga on the Zambesi and described by him in the Proceedings of the Society[1]. Although the horns of this Zululand specimen, and also those of a second example which Mr. Neumann had generously presented to the National Collection, were stouter and heavier, without being longer, than those of the type, Mr. Thomas had little hesitation in referring them to the same species, the difference appearing to be merely one of age.

N. livingstonianus, as evidenced by Mr. Neumann's two perfect specimens, differed from its near ally, *N. moschatus*, Von Düb., the Zanzibar Antelope, in its decidedly larger size and thicker horns, also in the much greater extension of the bony palate posteriorly behind the molars, and in its much brighter and more rufous colour. In this last respect there was a considerable difference between the two, the general colour above of *N. moschatus* being dull fawn-grey, while in *N. livingstonianus* it was rich rufous verging on chestnut; the flanks and legs also were far brighter and more rufous. In the length of the ears and their coloration, and in the general distribution of the body and limb colours, there appeared to be a close agreement between the two species; the tail of *N. livingstonianus* was, however, much more decidedly black above than that of *N. moschatus*.

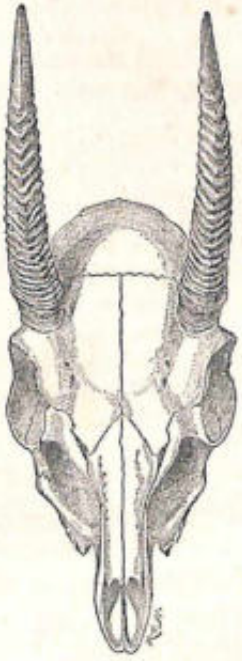
[1] P. Z. S. 1864, p. 657.

The dimensions of Mr. Neumann's specimen, taken on the stuffed animal, a fully adult male, were as follows :—

Height at withers 348 mm. (=13·75 inches). Length of head and body round curves, 596 ; ears from notch, 93 ; hind foot, without hoof, 170 ; tail, 76. Length of body (chest to rump in a straight line), 419.

Skull—basal length, 111 ; greatest length, 124 ; greatest breadth, 59 ; gnathion to orbit, 60 ; muzzle in front of teeth, 32 ; length of tooth-series, 38·5 ; palate, length, 71.

Horns, length 87, circumference at base 50.



Head of *Nanotragus livingstonianus*.

In the 'Field' for September last year[1] Mr. Neumann had written an account of the distribution and habits of this Antelope, and had there stated that its native Zulu name was "Inhlengane," that its ordinary habitat was the bushy parts of the low country between the coast and the Bombo range, and that the present specimen, which had been killed on the Umkuzi River, represented the extreme southerly limit of its range. Further north he had heard of it in the neighbourhood of the Lower Limpopo and Komati rivers ; and Mr. Thomas's present identification of it with

[1] 'Field,' lxxx. p. 368, Sept. 1892.

N. livingstonianus carried its northern range onwards to the Zambesi.

Mr. Neumann stated that the species had a very strong musky odour, which presumably came from the suborbital glands, and also that there were in this species very well marked interdigital pits.

Dr. C. J. Forsyth Major exhibited a tooth of an Ant-bear (*Orycteropus*) from the Upper Miocene of Maragha (Persia), and made the following remarks:—

"The tooth, of which I present a sketch (see woodcut), forms part of a small collection of Mammalian remains from Maragha (Persia), sent to the British Museum, together with remains of several other interesting Mammals from the same deposit, by M. R. Damon[1].

"As to its belonging to *Orycteropus*—of which it is apparently an antepenultimate right lower molar—there cannot be the least doubt, there being no other Mammal that presents this general form, as well as the minute structure, which was compared by Cuvier with the section of a cane, and is produced by the polygonal prisms of dentine, each of which has a tubular pulp-cavity in its centre.



Lower molar of *Orycteropus gaudryi*.

a. Top view; *b*. Side view; *c*. Part of lower surface, much magnified.

"With regard to the specific determination, up to the present date only one fossil form of this genus is known, namely *Orycteropus gaudryi*, Major, from the Upper Miocene of the isle of Samos. The size of the Maragha tooth is that of the Samos form, viz. about one fifth smaller than that of the living species. As the present known fauna of Maragha, which is not numerous, has not less than 13 species in common with Samos, I feel myself fairly entitled to apply the same specific name to the fossil from Maragha.

"Apart from the size, there are but small differences between the fossil and the recent species of *Orycteropus*. The upper profile of the skull is more horizontal in the fossil form. The *lachrymal* is more elongate and absolutely longer in the smaller Miocene form, the relative proportion in the length of the two being as 23 : 21·5 millim.; in the recent species this bone is almost square.

[1] See Quart. Journ. Geol. Soc. for May 1886, pp. 173–176.

"The anterior teeth, which O. Thomas [1] has shown to be premolars, are stouter and more numerous in the fossil than in the adult recent species, there being four premolars above and below, and, moreover, in the mandibula an eighth tooth, which, as to its position and shape, may be considered to be the homologue of a canine. In the upper jaw the anterior part of the snout is broken, but there must doubtless have existed a canine too.

"The bones of the pes present no differences from those of the now living forms, with the exception of the first and fifth metatarsals, which are somewhat stouter in the fossil, a fact which leads to the supposition that there is in the recent *Orycteropus* a tendency towards the reduction of the digits.

"Thus, on the whole, the fossil approaches closely its African congeners, and gives us no clue as to what might have been the ancestral form of the genus, which we place amongst the Edentates, there being no suitable place for it anywhere else.

"There was a time when *Marsupials*, *Edentates*, *Lemuroids*, and *Ratitæ* were considered as proofs of the former existence of an Antarctic continent, from which, their original home, they were believed to have spread northwards, peopling the various Continents in which they actually exist. Of late years, however, one after the other of these groups have been discovered in the Tertiary deposits of the Northern Hemispheres, in Europe and America. As regards the *Struthionidæ*, I have found in Samos a femur which can scarcely be distinguished from the same bone of the African *Struthio*. Remains of *Struthio* have, as is well known, likewise been stated, by A. Milne Edwards and Lydekker, to form part of the Siwalik fauna; and an egg of *Struthio* has been found in Southern Russia (Gouvernement Cherson) [2]. Therefore a more natural explanation of the present distribution of the groups above mentioned is to consider the southern points of the present continental masses as their last refuges, to which they have been driven by later invaders from the North [3].

"The presence of *Orycteropus* in the Ethiopian fauna had remained unexplained. The facts adduced this evening show that during the Upper Miocene representatives of this genus existed as far north and eastwards as the isle of Samos and Eastern Persia."

The following papers were read:—

[1] Oldfield Thomas, "On the Milk Dentition in *Orycteropus*," Proc. Roy. Soc. London, vol. xlvii. 1890, pp. 246–248.

[2] *Struthiolithus chersonensis*, Brandt.

[3] *Cf.* Haacke (Biolog. Centralblatt, vi. p. 363).

1. Suggestions for the more definite use of the word "Type" and its compounds, as denoting Specimens of a greater or less degree of Authenticity. By OLDFIELD THOMAS, F.Z.S.

[Received February 14, 1893.]

As systematic zoology becomes more and more exact and detailed, the great value of the actual specimens to which specific names have been applied, *i. e.* the "types," has been more and more appreciated, but at the same time the word itself has been applied by different authors so loosely and to specimens of such very varied degrees of authenticity, that it seems as though an exact definition of the term were somewhat of a desideratum, and that at the same time it would be of great convenience to have by means of compounds of the word "type" a set of names each applying definitely to some particular class of specimens. The word "type" itself when first introduced was meant to refer to the particular specimen (in the singular) originally described, but it soon was naturally applied to any individual of the original series, if more than one specimen was examined by the describer. In this there was little cause for confusion, but more recently it has been applied to any individual from the collection of the original author, obtained no matter how much later, and often not even determined by him as belonging to his species. Of late a still further cause of confusion has been introduced by certain authors who, obtaining specimens from the typical locality, have spoken of them as "typical specimens," a method of reference which, although due to a praiseworthy regard for geographical exactness, is yet certainly liable to give rise to inconvenience and confusion.

But it will be readily admitted that these various classes of specimens have each a certain value in relation to their respective species, and, as the best means of obviating the confusion above referred to, it appears advisable that they should have definite names showing their greater or less degree of closeness to the true original type.

Already, as a step towards this end, the word "co-type" has been introduced [1] for any specimen which was one of several forming the basis of the original description; but, like "type," it has become loosely and vaguely used for different sorts and classes of specimens, and equally needs definition and pinning down to one particular class, for which alone it should be used.

So far as regards their original material, species may be described in one or other of the three following ways:—

I. On a single specimen, no others being seen.

II. On two or more specimens, no one of them being selected as the "type."

III. On a specimen selected out of a series of two or more, and specially mentioned at the time as the "type."

[1] I believe in the first case by my colleague Mr. C. O. Waterhouse.

As to category I. there is or ought to be no confusion whatever. The one specimen, and that alone, is the "type," no matter how many specimens the original collector may afterwards send home, or the original author afterwards determine.

In the case of category II., all the specimens on which the author based his species, be they many or few (but no specimens received or named afterwards), would be "co-types," there being then no single "type" of the species at all, as all the co-types may be supposed together to form the type.

In the case of category III., as the author has selected his type, that, and that alone, would remain as such, but since the other specimens mentioned or enumerated by him in the original description are of unquestionably great value in a typical sense, they ought also to have a name and might be called "para-types" (or side-types).

Next, to meet the case of specimens collected afterwards at the same place as the originals, and having thus at least a local claim to authenticity, the word topo-type (or place-type) might be suggested, but it should, so far as possible, be restricted to specimens collected within, say, a few miles of the original typical locality.

In addition, it may be thought that specimens received from the original locality after the first description is published, but verified as belonging to his own species by the describer of it himself, should have a peculiar name, and for such there might be suggested the name "meta-type" (or after-type). As, however, we know from experience that it is by no means impossible for the author of a name to apply it wrongly, such meta-types would be of but little more value than simple topo-types, especially if determined long after the first description of the species.

The following are, then, the definitions now suggested for the different terms:—

A *Type* is a single specimen either unaccompanied by others at the time of description, or else deliberately selected as such by the author out of a series.

A *Co-type* is one of two or more specimens together forming the basis of a species, no *type* having been selected. No species would have both type and co-types, but either the former, or two or more of the latter.

A *Para-type* is a specimen belonging to the original series, but not the type, in cases where the author has himself selected a type. It should, however, be one of the specimens mentioned or enumerated in the original description.

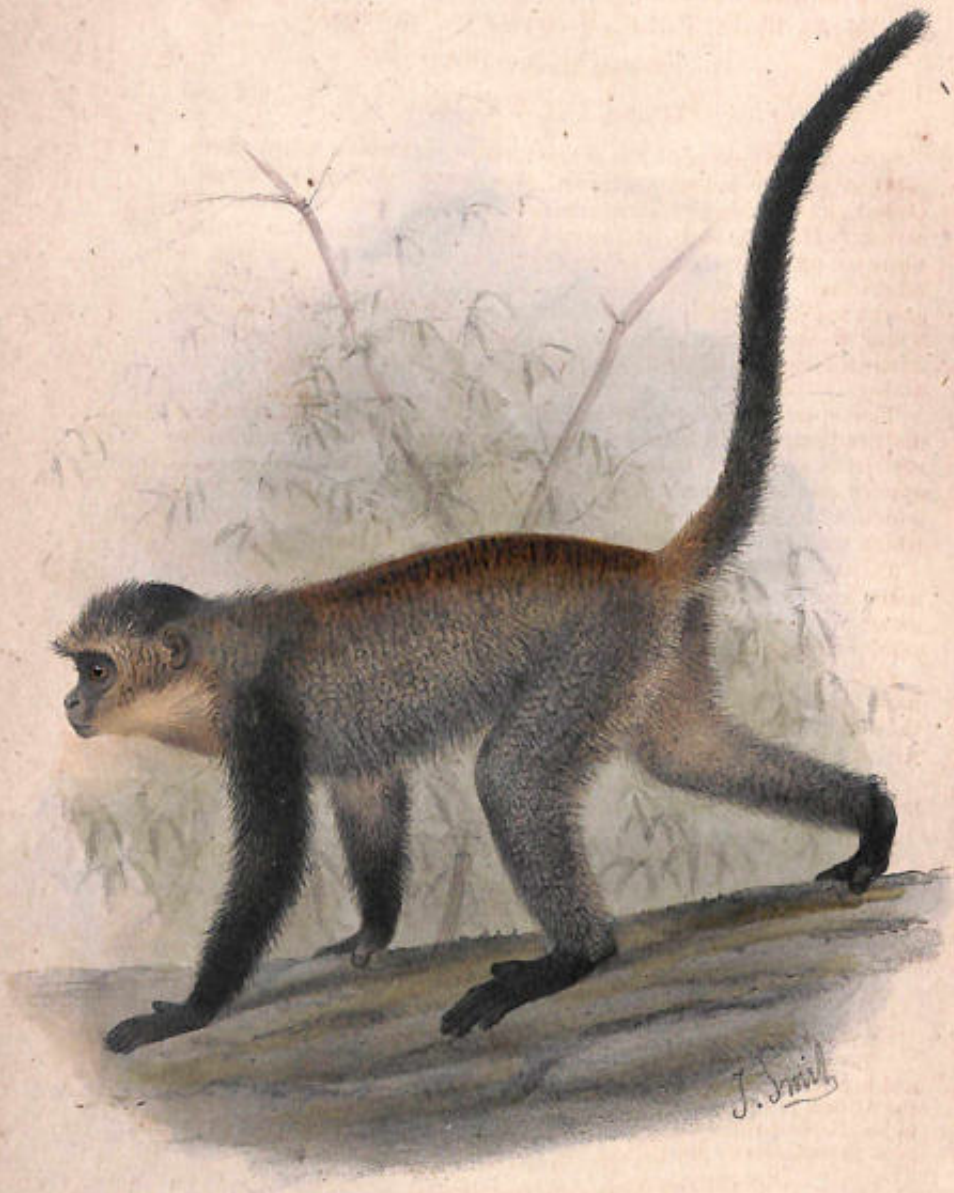
A *Topo-type* is a specimen simply collected at the exact locality where the original type was obtained.

A *Meta-type* is a specimen received from the original locality after the description has been published, but determined as belonging to his own species by the original describer himself.



J. Smit del. et lith. Mintern Bros. imp.

CERCOPITHECUS SCHMIDTI.



J. Smit. del. et lith.

Mintern Bros. imp.

CERCOPITHECUS MOLONEYI.

2. On a new African Monkey of the Genus *Cercopithecus*, with a List of the known Species. By P. L. Sclater, M.A., Ph.D., F.R.S., Secretary to the Society.

[Received March 8, 1893.]

(Plates XVI. & XVII.)

Since the Monkeys of the characteristic Æthiopian genus *Cercopithecus* were reviewed by Martin[1], Geoffroy St.-Hilaire[2], Wagner[3], Gray[4], and Schlegel[5], many additions have been made to the series. Having had occasion to look up the recent contributions to our knowledge of this subject, I have thought that it might save future workers some trouble if I ask the Society to accept for publication a new list of the described species, drawn up while I have been endeavouring to find names for some East-African members of this group which have lately come under my notice.

The species of *Cercopithecus*[6] are obviously very local in their distribution, and in many cases apparently confined to narrowly restricted areas. I have therefore added under the head of each species a short record of the positively ascertained localities in which it has been procured. I have also indicated the species of which we have received living examples in the Society's Gardens.

I have not included *Myopithecus* (with the last inferior molar with three tubercles only) and *Cercocebus* (with the last inferior molar with five tubercles) in my list, but only the typical *Cercopitheci* (with the last inferior molar with four tubercles).

Of this genus as limited by Geoffroy St.-Hilaire some 45 species have been described. I will divide these into two categories:—those of which I have personally examined specimens, and those which I know only from their published descriptions.

The 31 species known to me may be divided for convenience of treatment into six sections as follows:—

	Species.
Sect. A. *Rhinosticti*.	
With a distinct nose-spot, white, blue, or red ..	1–9

[1] Martin, 'General Introduction to the Natural History of Mammiferous Animals.' London, 1841.
[2] Geoffroy St.-Hilaire, in d'Orb. Dict. univ. d'Hist. nat. iii. p. 296 (1843).
[3] Wagner, Säugeth. v. p. 38 (1855).
[4] Gray, Catalogue of Monkeys, &c. p. 20 (1870).
[5] Schlegel, Mus. d. Pays-Bas, *Simiæ*, p. 68 (1876).
[6] The generic name *Cercopithecus*, though used by Ray, Klein, and Brisson, and in a binomial sense by Erxleben, appears to have been first restricted to and in a binomial sense by Erxleben, appears to have been first restricted to the African group of Monkeys to which it is now universally applied by Martin in his 'Natural History of Mammiferous Animals' (1841). *Cercopithecus* is a good classical term. Martial says (Epigr. xiv. 202):—

"Callidus emissas eludere Simius hastas,
"Si mihi cauda foret, Cercopithecus eram."

	Species.
Sect. B. *Chloronoti.*	
Above olive-green; beneath white	10–15
Sect. C. *Erythronoti.*	
Above rufous; beneath white	16, 17
Sect. D. *Melanochiri.*	
Arms, hands, and feet black	18–26
Sect. E. *Auriculati.*	
Ears with long tufts	27–29
Sect. F. *Barbati.*	
With a long pointed white beard	30, 31

Sect. A. *Cercopitheci rhinosticti.*

The nine species of the "spot-nosed" group with which I am acquainted may be diagnosed as follows :—

A. Naso piloso, albo.
  a. Pectore albo.
    a'. Cauda non rufescente.
      a''. Brachiis cinereis.
        a'''. Genis albis.
          Capite nigro cincto ..... 1. *petaurista.*
          Capite post. unicolore ..... 2. *buettikoferi.*
        b'''. Genis olivaceis ..... 3. *martini.*
      b''. Brachiis nigris ..... 4. *ludio.*
    b'. Cauda rufescente.
      Genis anguste nigris ..... 5. *melanogenys.*
      Genis late nigris ..... 6. *schmidti.*
  b. Pectore cinereo ..... 7. *victitans.*
B. Naso piloso, rubro ..... 8. *erythrotis.*
C. Naso semi-nudo, cæruleo ..... 9. *cephus.*

1. Cercopithecus petaurista.

Simia petaurista, Schreb. Säug. i. p. 103, t. xix. B (1775).

Cercopithecus petaurista, Erxl. Syst. Reg. An. p. 35 (1777); Martin, M. An. p. 539; Geoffr. Dict. univ. d'Hist. nat. iii. p. 301; Wagn. Säug. Suppl. v. p. 50 (1855); Gray, P. Z. S. 1868, p. 182; id. Cat. Monk. B. M. p. 20 (1870); Schleg. Mus. P.-B. vii. p. 86 (1876); Scl. List Vert. (1883) p. 13.

Ascagne (*Cerc. ascanius*), F. Cuv. Mamm. i. pl. 18 (?).

Hab. Gold Coast (*Mus. Lugd.*).

This is one of the commonest of the *Cercopitheci* in captivity. We have always examples of it living in the Gardens. The black line which passes above the ears and borders the crown behind serves to distinguish this species from all its allies. The sharply defined white of the lower surface of the tail is another peculiar character of *C. petaurista*.

2. Cercopithecus buettikoferi.

Cercopithecus büttikoferi, Jentink, Notes Leyd. Mus. viii. p. 56 (1886).

Hab. Liberia (*Büttikofer*).

This species, described from specimens in the Leyden Museum,

is closely allied to *C. petaurista*, but has no black band round the back of the head. There are two skins, received from Leyden, in the British Museum.

3. CERCOPITHECUS MARTINI.

Cercopithecus martinii, Waterh. P. Z. S. 1838, p. 58, et 1841, p. 71; Martin, M. An. p. 542; Wagn. Säug. Suppl. v. p. 50 (1855) (footnote); Gray, P. Z. S. 1868, p. 182; id. Cat. Monk. B. M. p. 21 (1870); Scl. P. Z. S. 1884, p. 176, pl. xiv.

Hab. Fernando Po or adjacent coast.

This Monkey is easily distinguishable from *C. petaurista* by its greenish cheeks, without any white stripe beneath the ears, the bluish skin on the face, the greenish colour of the tail above, and the black hands and feet. We have a fine living specimen (received Feb. 19, 1884) now in the Society's Menagerie.

4. CERCOPITHECUS LUDIO.

Cercopithecus ludio, Gray, P. Z. S. 1849, p. 8, pl. ix. fig. 1, et 1862, p. 182; id. Cat. Monk. B. M. p. 21 (1870); Wagn. Säug. Suppl. v. p. 51 (1855); Scl. List Vert. (1883) p. 13.

Hab. West Africa: Delta of Niger (*Baikie*); Cameroons (*Crossley*).

I have examined the specimens of this species in the British Museum, including the type which is badly figured (*l. s. c.*). I believe it to be a good species, characterized by its black limbs and rufous rump.

We had a specimen of this Monkey living in the Gardens in 1871, of which there is a coloured sketch by Smit in the Library. We have since received other individuals, but have not always distinguished them from the allied species.

5. CERCOPITHECUS MELANOGENYS.

Cercopithecus melanogenys, Gray, Ann. & Mag. N. H. xvi. p. 212 (1845); id. P. Z. S. 1849, p. 7, pl. ix. fig. 2, et 1868, p. 182; id. Cat. Monk. B. M. p. 21 (1870); Wagner, Säug. Suppl. v. p. 50 (1855); Scl. P. Z. S. 1860, p. 246; Monteiro, P. Z. S. 1860, p. 112; Jent. Notes L. M. x. p. 11 (correct descr.).

Hab. Angola (*Monteiro*).

The type of this species (badly figured *l. s. c.*) is in the British Museum. It has the lower cheeks black, a spot between the eye and ear whitish, and the tail-end rufous.

6. CERCOPITHECUS SCHMIDTI. (Plate XVI.)

Cercopithecus ascanias (?), Scl. P. Z. S. 1887, p. 502.

Cercopithecus schmidti, Matschie, Zool. Anz. p. 161 (1892).

Hab. Int. Eastern Africa; Manyuema, west of Tanganyika (*Schmidt*); Uganda (*Stuhlmann*).

A skin of this species has been lately received at the British

Museum from Berlin. It is closely allied to *C. melanogenys*, but differs in having only a very narrow black streak beneath the conspicuous white cheeks, the fur above more punctulated, and a much brighter rufous tail.

There can be no doubt that the Monkey which I described in 1887 from a specimen formerly living in the Society's Menagerie, and referred doubtfully to *C. ascanias*, belonged to *C. schmidti*. I now exhibit a coloured sketch of this individual (Plate XVI.) taken by Mr. Smit in 1884. This specimen, presented by the Rev. W. C. Willoughby in December 1883, was originally obtained in Manyuema. It died in November 1886.

7. CERCOPITHECUS NICTITANS.

Simia nictitans, Linn. Syst. Nat. i. p. 40 (1766).

Cercopithecus nictitans, Erxl. Syst. Regn. An. p. 35 (1777); Martin, Monk. p. 536; Geoffr. Dict. univ. d'Hist. nat. iii. p. 301; Wagn. Säug. Suppl. p. 50 (1855); Gray, P. Z. S. 1868, p. 182; id. Cat. Monk. B. M. p. 21 (1870); Schleg. Mus. P.-B. vii. p. 89 (1876); Scl. List Vert. (1883) p. 12.

Hocheur (*Cercopithecus nictitans*), F. Cuv. Hist. Nat. Mamm. i. pl. 17 (1825).

Hab. West Africa.

This Monkey is distinguished from all the other species of the section known to me by the absence of black stripes on the face, by the grey under surface, and by the peculiar shape of the white nose-spot, which is narrowed above and broadened below.

It is not uncommon in captivity, and we have had some 10 or 12 specimens of it during the past thirty years, but I know of no authentic record of the exact district of West Africa in which it is found wild.

8. CERCOPITHECUS ERYTHROTIS.

Cercopithecus erythrotis, Waterh. P. Z. S. 1838, p. 59, et 1841, p. 71; Martin, M. An. p. 535; Fraser, Zool. Typ. pl. iv. (1848); Wagn. Säug. Suppl. v. p. 49 (1855); Gray, P. Z. S. 1868, p. 182; id. Cat. Monk. B. M. p. 21 (1870); Schleg. Mus. P.-B. vii. p. 70 (1876); Scl. P. Z. S. 1884, p. 176.

Hab. Fernando Po (*Fraser*).

This species is quite unmistakable from its red nose (of which the upper portion is sparingly covered with red hairs), reddish ears, and bright ferruginous red tail. We first received a living specimen of it in 1884, and another in 1885. The former lived until January 1888. I exhibit its skin.

9. CERCOPITHECUS CEPHUS.

Simia cephus, Linn. Syst. Nat. i. p. 39 (1766).

Moustac (*Cercopithecus cephus*), F. Cuv. Hist. Nat. Mamm. i. pl. 19 (1821).

Cercopithecus cephus, Martin, M. An. p. 532; Wagn. Säug. Suppl

v. p. 49 (1855); Gray, P. Z. S. 1868, p. 182; id. Cat. Monk. B. M. p. 20 (1870); Schleg. Mus. P.-B. vii. p. 91 (1876).

Hab. Gaboon and Congo (*Mus. Lugd.*); Cabonda (*Monteiro*).

The Moustache Monkey is also readily distinguishable by its naked blue nose and yellowish cheek-tufts. It is often brought alive to Europe, and we have had many specimens of it living in the Monkey-house. Schlegel gives Gaboon and Congoland for its localities; we have received living examples procured by Monteiro in Cabonda, just north of the Congo.

Sect. B. *Cercopitheci chloronoti*.

The Green Monkeys known to me are six in number. They are all more or less of an olivaceous green above and white beneath. Their arms and legs are greyish, not black. They may be shortly diagnosed as follows:—

A. Facie carnea ..... 10. *cynosurus*.
B. Facie nigra.
  a. Frontis fascia alba.
    a'. Ano concolore.
      Mystacibus elongatis albis : scroto cæruleo ... 11. *griseo-viridis*.
      Mystacibus modicis flavidis : scroto viridi ... 12. *callitrichus*.
    b'. Ano rufescente.
      Dorso olivaceo .. .. 13. *lalandii*.
      Dorso flavicanti-olivaceo..... 14. *pygerythrus*.
  b. Frontis fascia alba nulla ..... 15. *erythrarchus*.

10. Cercopithecus cynosurus.

Simia cynosuros, Scop. Delic. Flor. Faun. Insubr. i. p. 44, t. xix. (1786).

Malbrouck (*Cercopithecus cynosurus*), F. Cuv. Hist. Nat. Mamm. i. pl. 24 (1819).

Cercopithecus cynosurus, Martin, M. An. p. 515; Geoffr. Dict. univ. d'Hist. nat. iii. p. 306; Wagn. Säug. Suppl. v. p. 38 (1855); Schleg. Mus. P.-B. vii. p. 72 (1876); Scl. List Vert. (1883) p. 5.

Chlorocebus cynosurus, Gray, Cat. Monk. B. M. p. 26 (1870).

Hab. West Africa: Senegambia? (*Schlegel*).

The Malbrouck is one of the commonest of this genus of Monkeys in captivity. During the past ten years we have had at least 25 specimens of it. It is at once recognizable, when alive, by its pale flesh-coloured face, and the blue scrotum of the male.

Schlegel believes that Senegambia is its true patria, but this is a point upon which further information is required. I find it included in Rochebrune's list ('Faune de la Sénégambie,' Mamm. p. 33), but I fear his authority is hardly reliable.

11. Cercopithecus griseo-viridis.

Simia sabæa, Linn. Syst. Nat. i. p. 38 (1766)?

Cercopithecus sabæus, Geoffr. Cat. Prim. p. 22; Schleg. Mus. P.-B. vii. p. 74 (1876).

Chlorocebus engythithia, Gray, Cat. Monk. B. M. p. 26 (1870).

Cercopithecus griseo-viridis, Desm. Mamm. p. 61 (1820); Martin, M. An. p. 518; Blanford, Zool. Abyss. Exp. p. 224; Scl. List Vert. (1883) p. 6.

Grivet (*Cerc. griseus*), F. Cuv. Mamm. i. pl. 22 (1819).

Hab. East Africa: Abyssinia (*Rüppell* and *Blanford*); Sennaar (*Clot-Bey*).

There is a great difference of opinion as to what the *Simia sabæa* of Linnæus refers to. It is therefore better to reject the name altogether, and to call this species *griseo-viridis*. The "Grivet" is also pretty common in captivity, but not so frequently imported as the Vervet and Green Monkey. Its long white whiskers and the blue scrotum of the male distinguish it from *C. callitrichus*, its West-African representative.

12. CERCOPITHECUS CALLITRICHUS.

Cercopithecus callitrichus, Geoffr. Cat. p. 23; Schl. Mus. P.-B. *Simiæ*, p. 73; Scl. List Vert. (1883) p. 7.

Callitriche (*Cerc. sabæus*), F. Cuv. Mamm. i. pl. 21.

Cercopithecus sabæus, Wagn. Säug. v. p. 40; Martin, M. An. p. 519.

Chlorocebus sabæus, Gray, Cat. Monk. p. 25.

Hab. Senegambia (*Mus. Lugd.*); Liberia (scarce, *Büttikofer*).

The Green Monkey is, I think, the commonest of this section in captivity next, perhaps, to the Vervet. We have generally a good supply of specimens of both these species, which do well in our Gardens. The yellow-tinged and shorter whiskers and the green scrotum of the male distinguish the Green Monkey from the Grivet.

The Green Monkey has been introduced in some of the West-Indian islands, and has become an indigenous species there. See my notes on this subject, P. Z. S. 1866, p. 79. It is said also to have been introduced into St. Iago—one of the Cape Verd group (Schl. Mus. P.-B. *Simiæ*, p. 74).

13. CERCOPITHECUS LALANDII.

Cercopithecus lalandii, Geoffr. Dict. univ. d'Hist. nat. iii. p. 305; id. Cat. Prim. p. 21; Wagner, Säug. v. p. 39; Scl. List Vert. (1883) p. 6.

Cercopithecus pygerythrus, Martin, M. An. p. 521; Schl. Mus. P.-B. *Simiæ*, p. 76.

Hab. South Africa, Cape Colony.

"The Vervet is closely allied to the Malbrouck and Grivet, so that a little care and attention are necessary to enable the observer to discriminate between them. It differs, however, from both in having the fur long, and rather coarse, and of a much greyer tint, the wash of olive being less decided, in the tail being black, nearly throughout its whole length; and in the superciliary bristles being very conspicuous. From the Malbrouck it may be distinguished by the muzzle being less thick and heavy, and from the

Grivet by the rust-red hairs on the space below the root of the tail." (*Martin*, op. cit.)

The Vervet is one of the commonest species of this genus brought to Europe alive.

14. CERCOPITHECUS PYGERYTHRUS.

Vervet (*Simia pygerythra*), F. Cuv. Mamm. i. pl. 23 (1821).

Cercopithecus pygerythrus, Desm. Mamm. Suppl. p. 534 (1820); Geoffr. Cat. Prim. p. 21; Wagn. Säug. v. p. 39; Peters, Reise n. Moss., Säug. p. 4 (Zambesia); Thomas, P. Z. S. 1885, p. 219 (Kilimanjaro).

Cercopithecus rufo-viridis, Scl. List Vert. (1883) p. 8; id. P.Z.S. 1860, p. 420.

Hab. East Africa, from Mozambique to Kilimanjaro.

If I am correct in identifying this species with the true *C. pygerythrus* it is a very close ally of the Vervet (*C. lalandii*), and differs mainly in its yellowish-green colour above. I have until recently called this species *C. rufo-viridis*, and am not now quite clear that it is *C. pygerythrus*; but I am inclined to think so from what Wagner says (*l. s. c.*).

15. CERCOPITHECUS ERYTHRARCHUS.

Cercopithecus erythrarchus, Peters, Reise n. Moss., Säug. p. 1, pl. 1; Schleg. Mus. P.-B. *Sim.* p. 77; Kirk, P. Z. S. 1864, p. 649 (Zambesi); Reuvens, Zool. Gart. xxx. p. 207 (Zambesi); Oudemans, Zool. Gart. xxxi. p. 267.

Hab. Mozambique (*Peters*); Lower Zambesi (*Kirk*).

Apparently quite distinct from the preceding species, being without any white frontal band and having the lower rump rufous. We have a young living specimen now "on deposit" in the Monkey-house which, I suspect, belongs to this species. It is said to have been obtained on the Congo.

Sect. C. *Cercopithecei erythronoti.*

Of this section, which is at once recognizable by members of it being bright rufous above and white beneath, only two species are known to me, which may be discriminated as follows:—

A. Supra ruber flavido mixtus; naso nigro ..... 16. *patas.*
B. Supra ruberrimus; naso albo ..... 17. *pyrrhonotus.*

16. CERCOPITHECUS PATAS.

Simia patas, Schreb. Säug. t. xvi. (1774).

Cercopithecus patas, Erxl. Syst. R. An. p. 34; Schleg. Mus. P.-B. vii. p. 84 (1876); Scl. List Vert. (1883) p. 8.

Simia rubra, Gm. Syst. Nat. i. p. 34 (1788).

Cercopithecus ruber, Geoffr. Ann. d. Mus. xix. p. 96 (1812); id. Dict. univ. d'Hist. nat. iii. p. 307; Martin, M. An. p. 509; Wagn. Säug. Suppl. v. p. 42 (1855); Scl. P. Z. S. 1874, p. 664; id. List Vert. (1883) p. 8.

Patas (*Simia rubra*), F. Cuv. Hist. Nat. Mamm. i. pl. 25 (1820).

Chlorocebus ruber, Gray, Cat. Monk. B. M. p. 25 (1870).

Hab. West Africa: Senegal (*Mus. Lugd.*).

The Patas is subject to a certain amount of individual variation, and I was at one time of opinion that it might be possible to distinguish two forms of this species (*cf.* P. Z. S. 1874, p. 664). It is much more common in captivity than the Nisnas.

17. CERCOPITHECUS PYRRHONOTUS.

Cercopithecus pyrrhonotus, Hempr. et Ehr. Symb. Phys. pl. x.; Geoffr. Dict. univ. d'Hist. nat. iii. p. 307; Wagn. Säug. v. p. 42; Scl. P. Z. S. 1871, p. 623; id. List Vert. (1883) p. 8; Schleg. Mus. P.-B. *Sim.* p. 84.

Cercopithecus ruber, Rüpp. Neue Wirbelth. p. 8.

Nisnas, F. Cuv. Hist. Nat. Mamm. i. pl. 27 (1830).

Hab. Kordofan and Darfour (*Rüppell*); Somaliland (*Soc. Zool. Viv.*).

We have received altogether seven examples of the Nisnas, which is quite distinct from the Patas when seen alive. A fine male, presented Sept. 29th, 1882, by Mrs. F. Dixon, was stated to have been brought from Somaliland.

Sect. D. *Cercopitheci melanochiri.*

The nine species referred to this section, all of which have the arms and legs black or dark cinereous, may be diagnosed as follows:—

A. Pectore albo.
  a. Striga femorali alba ..... 18. *mona.*
  b. Striga femorali nulla.
    Dorso toto concolore; ano rufo ..... 19. *albigularis.*
    Dorso postico cum ano nigro ..... 20. *campbelli.*
B. Pectore cinereo.
  c. Maculis auricularibus nullis.
    Dorso concolore ..... 21. *samango.*
    Dorso postico brunneo ..... 22. *moloneyi.*
  d. Macula utrinque ad aures rubra ..... 23. *stairsi.*
C. Pectore rubro ..... 24. *erythrogaster.*
D. Pectore nigro.
  Striga femorali alba; fronte nigro ..... 25. *neglectus.*
  Striga femorali nulla; fronte albo cincta ..... 26. *leucampyx.*

18. CERCOPITHECUS MONA.

Simia mona, Schreb. Säug. i. p. 97, t. xv. (1775).

Cercopithecus mona, Erxl. Syst. Reg. An. p. 32 (1777); Martin, M. An. p. 527; Wagn. Säug. Suppl. v. p. 47 (1855); Gray, P. Z. S. 1868, p. 182; id. Cat. Monk. B. M. p. 22 (1870); Scl. List Vert. (1883) p. 9; Schleg. Mus. P.-B. vii. p. 80 (1876).

Mone (*Cercopithecus mona*), F. Cuv. Hist. Nat. Mamm. i. pl. 15 (1819).

Hab. West Africa: Cameroons (*Mus. Lugd.*).

The Mona is easily recognized by the white patch on the thighs, on each side of the tail, and the white band on the forehead. It

is not uncommon in captivity; we have had some 25 specimens of it since 1860.

19. CERCOPITHECUS ALBIGULARIS.

Semnopithecus? albogularis, Sykes, P. Z. S. 1831, p. 106.

Cercopithecus albogularis, Sykes, P. Z. S. 1832, p. 18; Martin, M. An. p. 512; Fraser, Zool. Typ. pl. ii. (1848); Wagn. Säug. Suppl. v. p. 45 (1855); Gray, P. Z. S. 1868, p. 182; id. Cat. Monk. B. M. p. 24 (1870); Schleg. Mus. P.-B. vii. p. 79 (1876); Scl. List Vert. (1883) p. 9; True, Pr. U. S. Nat. Mus. xv. p. 448 (Kilimanjaro).

Hab. East Africa, Kilimanjaro (*Abbott*): Gold Coast (*Pel*).

Sykes's Monkey, as this species is commonly called, is also frequently brought alive to this country. We have had some 25 specimens in the Menagerie during the past thirty years.

It belongs to the Mona group, but has no white thigh-patches, and the rump is more or less rufous.

Schlegel gives the locality of this species as Gold Coast (*Pel*); but it appears certainly to occur in East Africa, and it would be desirable that specimens from these countries should be compared.

20. CERCOPITHECUS CAMPBELLI.

Cercopithecus campbelli, Waterh. P. Z. S. 1838, p. 61; Fraser, Zool. Typ. pl. iii. (1848); Martin, M. An. p. 544; Wagn. Säug. Suppl. v. p. 47 (1855); Gray, P. Z. S. 1868, p. 182; id. Cat. Monk. B. M. p. 24 (1870); Schleg. Mus. P.-B. vii. p. 81 (1876); Scl. List Vert. (1883) p. 11; Jent. Notes L. M. x. p. 9 (Liberia).

Cercopithecus burnetti, Gray, Ann. N. H. x. p. 256 (1842).

Hab. West Africa: Gold Coast (*Pel*); Liberia (*Büttik.*), common.

Campbell's Monkey is by no means so common in captivity as the two preceding species. We have had, so far as our modern registers go, only eight examples of it.

It is easily distinguishable from *C. albogularis* by the black rump and outer surface of the thighs. It has a frontal band like the Mona, but tinged with rufous.

21. CERCOPITHECUS SAMANGO.

Cercopithecus samango, Sundev. Öfvers. K. Vet.-Akad. Förh. i. p. 160 (1844); Wagn. Säug. v. p. 44 (1855); Peters, P. Z. S. 1865, p. 400 (Angola); id. Reise n. Moss., Säug. p. 4 (Inhambane); Gray, P. Z. S. 1868, p. 182; id. Cat. Monk. B. M. p. 24 (1870); Schleg. Mus. P.-B. vii. p. 79 (1876); Scl. P. Z. S. 1888, p. 564.

Hab. Natal (*Wahlberg*); Mozambique (*Peters*); Angola (*Welwitsch*).

A single example of this scarce Monkey was acquired by the Society in 1888 (see P. Z. S. *l. s. c.*). It died June 4th, 1890. I now exhibit its skin.

Schlegel has united to this species *C. labiatus*, Geoffr., but I can see no traces of the white lips in our specimen, and am doubtful about the identification.

The Samango Monkey has the whole back of a nearly uniform colour, the hairs being yellowish olive, annellated with black; the lower surface of the base of the tail is dirty white, which colour extends round the sides of the tail, leaving a broad line on the upper median surface blackish; the tail-end is black. The outer surface of the arms is black. The outer surface of the legs is grey; the feet are black.

22. CERCOPITHECUS MOLONEYI, sp. nov. (Plate XVII.)

Supra olivaceus, nigricante annellatus, in capite obscurior; dorso medio ferrugineo nigro annellato; brachiis et manibus nigris; cruribus cinereis nigro mixtis; cauda, nisi ad ipsam basim, nigerrima; corpore subtus pallide fulvo nigricante punctulato: long. corp. 28 *poll., caudæ* 26 *poll.*

Hab. British Central Africa, north of Lake Nyasa.

I base this apparently new and distinct species upon a skin brought home and presented to me by Dr. J. A. Moloney, one of the surviving members of Stairs's Expedition to Katanga, to whom we are also indebted for our living specimen of *Cercopithecus stairsi*. Dr. Moloney obtained this specimen from Mr. Whyte at the African Lakes Company's Station of Karonga, at the north end of Lake Nyasa, in April 1892. Dr. Moloney informs me that it was procured by the natives of the surrounding district, which is named Nkonde[1], the people themselves being called the Wa-Nkonde.

The specimen appears to me to indicate, without doubt, a new species remarkable for its large size, long hairs, and the characteristic ferruginous broad band which covers the lower back. So far as I can tell from the single skin, from which the whole of the bones have been removed, *Cercopithecus moloneyi* appears to belong to the group of *C. samango* and the allied species, amongst which its large size and red back render it easily distinguishable.

23. CERCOPITHECUS STAIRSI.

Cercopithecus stairsi, Scl. P. Z. S. 1892, p. 580, pl. xl.

Hab. Lower Zambesi.

Stairs's Monkey, which I place here for the present, is at once distinguishable from all its allies by the red patches in front of the ears.

24. CERCOPITHECUS ERYTHROGASTER.

Cercopithecus erythrogaster, Gray, P. Z. S. 1866, p. 169, pl. xvi., et 1868, p. 182; id. Cat. Monk. B. M. p. 128 (1870); Murie, P. Z. S. 1866, p. 380 (anatomy); Schleg. Mus. P.-B. vii. p. 69.

Hab. West Africa.

We have never been so fortunate as to receive a second specimen of this remarkable Monkey, which may be at once known from its congeners by its red chest, white beard and whiskers, and black frontal band.

[1] See 'With Captain Stairs to Katanga,' by J. A. Moloney, p. 264.

There is a single specimen of the same species in the Leyden Museum, which was formerly living in the Zoological Garden of Rotterdam.

25. CERCOPITHECUS NEGLECTUS.

Cercopithecus leucocampyx, Gray, Cat. Monk. p. 22.
Cercopithecus neglectus, Schleg. Mus. P.-B. *Sim.* p. 70.

Hab. White Nile (*Petherick*).

This is a very distinct species, founded by Schlegel on a single flat skin in the British Museum from the White Nile, which was wrongly referred by Gray to *C. leucampyx*. It is grizzly grey above, and has the haunch banded something like it is in *C. diana*.

26. CERCOPITHECUS LEUCAMPYX.

Diane femelle (*Cercopithecus diana*), F. Cuv. Mamm. i. pl. 16.
Simia leucampyx, Fisch. Syn. Mamm. p. 20 (1829).
Cercopithecus pluto, Gray, P. Z. S. 1848, p. 56, pl. iii., et 1868, p. 182; id. Cat. Monk. B. M. p. 23 (1870); Wagn. Säug. Suppl. v. p. 48; Scl. P. Z. S. 1870, p. 670, 1871, p. 36, et 1892, p. 97 (Nyasaland).
Cercopithecus diadematus, Geoffr. in Bélang. Voy., Zool. p. 51 (1834).
Cercopithecus leucampyx, Martin, M. An. p. 529; Geoffr. Dict. univ. d'Hist. nat. iii. p. 304; Schleg. Mus. P.-B. vii. p. 83 (1876); Wagn. Säug. v. p. 48.

Hab. Angola and Congo (*Mus. Lugd.*); Nyassaland (*Sharpe*).

We have hitherto been in the habit of calling this well-marked species of Monkey *Cercopithecus pluto*. But, as pointed out by Schlegel, it is certainly entitled to bear the name *leucampyx* of Fischer, which was bestowed upon it twenty years previously. The Pluto or Diadem Monkey is certainly a rare species, although since 1870, when our first specimen was received, we have had altogether eight specimens in the Gardens. In October 1887 three Pluto Monkeys arrived in the Gardens together, along with a Gorilla, deposited by Cross of Liverpool.

The Pluto Monkey is at once recognizable by its conspicuous white frontal band; the rest of the head and the whole of the limbs and tail are black. It is rather difficult to understand how this very distinct species could ever have been mistaken for the female of the Diana Monkey.

Sect. E. *Cercopitheci auriculati.*

Of this section of the genus *Cercopithecus*, which is distinguished by its long yellowish ear-tufts and the three black lines on the head, three species, or what may be possibly only local subspecies, are distinguishable as follows:—

A. Dorso concolore ..... 27. *erxlebeni.*
B. Dorso postico nigro.
  Dorsi fascia angustiore, definita ..... 28. *pogonias.*
  Dorsi fascia latiore, confluente ..... 29. *nigripes.*

27. CERCOPITHECUS ERXLEBENI.

Cercopithecus erxlebenii, Puch. Rev. et Mag. de Zool. 1856, p. 96; Dahlb. Zoolog. Stud. p. 109, t. v. (1856); Gray, P. Z. S. 1868, p. 182; id. Cat. Monk. B. M. p. 23 (part.); Scl. P. Z. S. 1871, p. 36; id. List Vert. (1883) p. 10.

Hab. West Africa: Congo (*Monteiro*).

We received our first specimen of this beautiful species in 1870, since which date six others have arrived in the Society's Menagerie. It is possible, however, that some of these last may have been referable to two succeeding forms. But the three skins which I exhibit (received 5/9/82, 17/7/85, and 13/10/87) all belong to what I call true *erxlebeni*, which is without the black stripe on the lower back.

28. CERCOPITHECUS POGONIAS.

Cercopithecus pogonias, Benn. P. Z. S. 1833, p. 67; Wagn. Säug. Suppl. v. p. 43 (1855); Gray, P. Z. S. 1868, p. 182; id. Cat. Monk. B. M. p. 23 (1870).

Hab. Fernando Po (*Knapp*, *Thomson*, *Fraser*).

United by Schlegel to *C. erxlebeni*, but apparently quite distinct, and at once known by the well-defined black dorsal stripe. Type and three other specimens in the British Museum.

29. CERCOPITHECUS NIGRIPES.

Cercopithecus nigripes, Du Chaillu, Proc. Bost. N. H. Soc. vii. p. 360 (1860); Gray, P. Z. S. 1868, p. 182.

Cercopithecus pogonias, Schl. Mus. P.-B. *Simiæ*, p. 82.

Hab. Gaboon (*Du Chaillu*).

Like *C. pogonias* but darker, and the black dorsal stripe much broader and less well defined (*Mus. Brit.*).

Sect. F. *Cercopitheci barbati.*

This section, the members of which are at once recognizable by the long beard on the chin, contains only the well-known Diana Monkey and the recently described *C. brazzæ*, which may be distinguished as follows:—

Nose naked; frontal crest black and white ...	30. *diana*.
Nose hairy; frontal crest red	31. *brazzæ*.

30. CERCOPITHECUS DIANA.

Simia diana, Linn. Syst. Nat. i. p. 38 (1766).

Cercopithecus diana, Erxleb. Syst. Regn. An. p. 30 (1777); Martin, M. An. p. 523; Geoffr. Dict. univ. d'Hist. nat. iii. p. 304; Wagn. Säug. Suppl. v. p. 48 (1855); Gray, P. Z. S. 1868, p. 182; id. Cat. Monk. B. M. p. 22 (1870); Scl. List Vert. (1883) p. 10; Schleg. Mus. P.-B. vii. p. 92 (1876); Jentink, Notes L. M. x. p. 12 (Liberia).

Hab. Delta of Niger (*Fraser*); Gold Coast (*Pel*); Niger (*Fraser*); Liberia (*Büttikofer*).

The Diana Monkey is by no means scarce in captivity, and during the past thirty years we have had at least 25 specimens of it living in the Society's Monkey-house.

In Gray's Catalogue of Monkeys (p. 22) a "var. *ignita*" of this species is constituted, as having "the back edge and inner side of the thighs bright red-bay." On May 31st, 1889, we received, as a present, from Col. Wethered of Great Marlow, a female Monkey of this form, of which I now exhibit the skin. Besides the difference above referred to, it will be observed that the white frontal band is not so well marked in this specimen, and that the black of the chin is carried down over the upper part of the beard, which is shorter than in *C. diana typicus*. I propose to designate this subspecies *C. diana ignitus*. Col. Wethered kindly informs me that the specimen in question was brought from the Congo by Capt. Moore-Harper in 1886, so that *C. diana ignitus* is probably a southern form of *C. d. typicus*.

31. CERCOPITHECUS BRAZZÆ.

Cercopithecus brazzæ, Milne-Edw. Rev. Sc. sér. 3, xii. p. 15 (1886).

Hab. French Congoland (*Brazza*).

I have to thank our Foreign Member M. Alphonse Milne-Edwards for kindly sending me a stuffed head of this Monkey for



Head of *Cercopithecus brazzæ*.

exhibition. It is certainly most remarkable for its elevated red frontal band, which is composed of short erect hairs. This is bordered behind by a broad black band, which extends to the ears on both sides, and in front by a narrow black stripe over each eye. The upper portion of the nose is black, the lower portion, together with the cheeks and lips, is covered with short white hairs. The beard on the chin and throat is long and abundant, formed of white hairs.

This peculiar Monkey was discovered by M. Jacques de Brazza,

who in 1883 was sent out to French Congo on a special mission to explore the Natural Products of the new French territory between Gaboon and the river Congo.

APPENDIX.—*Index specierum mihi nondum obviarum.**

1. CERCOPITHECUS BOUTOURLINI.

Cercopithecus boutourlinii, Giglioli, Zool. Anz. x. p. 510 (1887).

Cercopithecus albigularis, Giglioli, Ann. Mus. Civ. Gen. ser. 2, vi. p. 8 (1888).

Hab. Central Africa.

This species was based on a specimen transmitted to the Florence Museum from Kaffa, N.E. Africa, by Dr. Traversi. It has been subsequently united to *C. albogularis*.

2. CERCOPITHECUS FLAVIDUS.

Cercopithecus flavidus, Peters, Reise n. Moss., Säug. p. 3, t. i. *b*.

Hab. Mozambique.

"Allied to *C. rufo-viridis* and *C. albogularis*."—*Peters*.

3. CERCOPITHECUS GRAYI.

Cercopithecus grayi, Fraser, Cat. Knowsl. Coll. p. 8 (1850); Gray, P. Z. S. 1868, p. 182; id. Cat. Monk. B. M. p. 22 (1870).

Hab. West Africa (*Knowsley Coll.*).

This is said to be very closely allied to *C. mona*, but to differ in having a yellowish-white spot over each eye, and a black stripe on each side of the head from eye to ear; up the centre of the forehead runs a darkish stripe, each hair being annulated with black and greenish yellow. There are no white spots on the crupper.

4. CERCOPITHECUS LABIATUS.

Cercopithecus labiatus, Geoffr. Compt. Rend. Acad. Sci. xv. p. 1038 (1842); id. Dict. univ. d'Hist. nat. iii. p. 302; id. Archiv. du Mus. ii. p. 555.

Hab. West Africa?

Sometimes considered to be the same as *C. samango*. Based on a single menagerie specimen.

5. CERCOPITHECUS MONOIDES.

Cercopithecus monoides, Geoffr. C. R. xv. p. 1038 (1842; descr.

* The following species is no doubt a *Cercocebus*, allied to *C. albigena*:—

CERCOPITHECUS ATERRIMUS.

Cercopithecus aterrimus, Oudemans, Zool. Gart. xxxi. p. 267 (1890).

Hab. Central Africa: Stanley Falls on the Congo.

nulla); id. Dict. univ. d'Hist. nat. iii. p. 303 (1843); id. Arch. du Mus. ii. p. 558, pl. 31.

Hab. Africa.

Described from a menagerie specimen. Allied to *C. mona*, perhaps the same as *C. albogularis*.

6. CERCOPITHECUS PALATINUS.

Cercopithecus roloway, Erxl. Syst. p. 42 (1777); Geoffr. Dict. univ. d'Hist. nat. iii. p. 304; id. Arch. d. M. ii. p. 558.

Cercopithecus palatinus, Wagn. Säug. v. p. 47.

Hab. Guinea.

Like *C. diana*, but with the belly white and the lower back very dark, nearly black.

7. CERCOPITHECUS PICTURATUS.

Cercopithecus picturatus, Santos, Jorn. Sci. Lisboa, xi. p. 98 (1886).

Hab. West Africa.

This species was based on an individual living in the Zoological Gardens, Lisbon. It belongs to the Spot-nosed section, and is allied to *C. petaurista*, but has the terminal four-fifths of the tail "copper-reddish." It is perhaps = *C. melanogenys*.

8. CERCOPITHECUS SIGNATUS.

Cercopithecus signatus, Jentink, Notes Leyd. Mus. viii. p. 55 (1886).

Hab. West Africa?

This species is based on a specimen formerly living in the Zoological Garden, Rotterdam. It belongs to the Spot-nosed group, and is allied to *C. petaurista* and *C. melanogenys*.

9. CERCOPITHECUS STAMPFLII.

Cercopithecus melanogenys, Schl. Mus. P.-B. *Sim.* p. 90 (*nec* Gray).

Cercopithecus stampflii, Jentink, Notes Leyd. Mus. x. p. 10 (1888).

Hab. Liberia.

This species was established on a specimen procured in Liberia by Büttikofer and Stampfli. It belongs to the White-nosed section, allied to *C. nictitans*, but differs from that species in having the underparts white.

10. CERCOPITHECUS OCHRACEUS.

Cercopithecus ochraceus, Peters, Reise n. Moss., Säug. p. 2, t. i. *a*.

Hab. Querimba, Mozambique.

Allied to *C. ruber* and *C. pyrrhonotus*, but body above yellowish.

11. Cercopithecus rufo-viridis.

Cercopithecus rufo-viridis, Geoffr. Compt. Rend. xv. p. 1038 (1842); id. Dict. univ. d'Hist. nat. iii. p. 307 (1843); id. Arch. du Mus. ii. p. 564, t. xxxii.; Wagn. Säug. Suppl. v. p. 40 (1855); Schleg. Mus. P.-B. vii. p. 78.

Chlorocebus rufo-viridis, Gray, Cat. Monk. B. M. p. 25 (1870).

Described from a menagerie specimen, of which the locality was not known; perhaps = *C. erythrarchus*.

12. Cercopithecus tantalus.

Cercopithecus tantalus, Ogilby, P. Z. S. 1841, p. 33.

Hab. Africa, *loc. ign.*

Founded on a specimen formerly living in this Society's Gardens. "Most nearly related to *C. sabæus* and *C. pygerythrus*."

13. Cercopithecus temminckii.

Cercopithecus temminckii, Ogilby, Library of Entertaining Knowl., Menageries, p. 345 (1838); Martin, M. An. p. 530.

Hab. Guinea.

This species was based by Ogilby on a specimen formerly in the Leyden Museum. Dr. Jentink, the present Director of that Institution, is not able to give me any information about it, stating that he does not believe that it could have been in that collection in 1853, when Temminck published his 'Esquisses Zoologiques sur la côte de Guinée,' as Temminck made no mention of it.

14. Cercopithecus werneri.

Cercopithecus werneri, Geoffr. C. R. xxxi. p. 874 (1850); id. Cat. Prim. p. 23; id. Arch. d. Mus. v. p. 539, pl. xxvii.; Wagn. Säug. v. p. 42.

Described from living specimens in the Jardin des Plantes. It belongs to the section of Green Monkeys, but is uniform fulvous above and white beneath, with a black face and golden-red tail-end.

15. Cercopithecus wolfi.

Cercopithecus wolfi, Meyer, Notes Leyd. Mus. xiii. p. 63 (1891).

Hab. Central West Africa.

Described from a living specimen in the Zoological Garden of Dresden. It belongs to the "*mona*" division of Schlegel, but is distinguished from all the other species by its ferruginous hind legs, and by the light patches on the inner side of the thighs and arms.

3. On *Odontaster* and the Allied or Synonymous Genera of Asteroid Echinoderms. By F. Jeffrey Bell, M.A., Sec.R.M.S.

[Received February 27, 1893.]

Although I have no intention of pursuing as far as I logically should an investigation which would carry one deep into the perplexities of the classification of the Asteroidea, it seems advisable to say a few words as to *Odontaster*.

As defined by Prof. Verrill in 1880[1], the characters of this genus are, perhaps, a little obscure; Mr. Sladen[2] says of it:—"I have great hesitation in placing *Odontaster* with the Archasteridæ; it may possibly prove to be more closely allied to the Pentagonasteridæ; in any case it appears to be an annectant genus between the two groups."

An important character in *Odontaster* is the possession of a "large, strong, sharp, erect or everted tooth."

Among the new genera of Pentagonasteridæ described in the 'Challenger' Report, one, *Gnathaster*, has the "mouth-plates with a prominent keel, developed aborally into a hyaline spiniform prolongation;" but no ground is given for suspecting that there is any relationship to *Odontaster*.

In his interesting and instructive Report on the Starfishes of the Mission to Cape Horn, Prof. Perrier diagnoses a new genus, which he calls *Asterodon*; the "pièces dentaires" in species of this genus carry "chacune un grand piquant vitreux réfléchi en dehors" or support "ensemble un piquant impair, unique, vitreux, interradial" (*op. cit.* p. K. 132). This genus, though "with an apparent resemblance to the Pentagonasteridæ, is regarded as, on the whole, having more affinity with the Archasteridæ, and reference is made, on the page cited, to Verrill's *Odontaster*. On p. K. 188 of the same memoir, Prof. Perrier makes some remarks on the genus *Gnathaster*, which he finds to be synonymous with, and to have priority as a name over, *Asterodon*—unless, he adds, "les *Odontaster* de M. Verrill ne soient des formes génériques identiques, ce qui paraît vraisemblable."

More fortunate than either Prof. Perrier or Mr. Sladen, I have been able to make a study of specimens of *Odontaster hispidus*, presented to the Trustees of the British Museum by the United States National Museum and authenticated by its authority. It soon became obvious that M. Perrier's supposition was correct, and the three names, therefore, are synonyms, *Odontaster* having a priority of nine years.

Like the English observer, the French one remarks that the forms of this genus are "manifestement des formes de passage." But while the former places his genus with the Pentagonasteridæ, the latter assigns his to the Archasteridæ.

[1] Amer. Journ. Sci. xx. (1880) p. 402. [2] Chall. Rep. Ast. (1889) p. xxix.

How is one less qualified than either of these two observers to settle a question on which they, with their ample knowledge, are divided? I, at any rate, pretend to no right or authority, but, as I have to assign the specimens to a systematic place in a list of Asteroidea which I am now preparing, it may be permitted to say why they are to be found with the Archasteridæ.

If we take the definitions offered us in the Introduction to the Report on the 'Challenger' collection of Starfishes, we find we might place *Odontaster* almost indifferently with either Archasteridæ or Pentagonasteridæ, though there is a slight balance in favour of the former. If we take M. Perrier's latest revision of his scheme of classification, there can be no doubt that the definition of the order Paxillosæ[1] (*op. cit.* p. K. 71) applies to *Odontaster* very much better than does the definition of the Valvulatæ; and the Pentagonasteridæ belong to the latter, the Archasteridæ to the former of these two orders.

But at this point I must stop or I shall be drawn into a discussion as to the classification of the subdivisions of Asteroids, which would be far too lengthy for me just now. Only let me point the moral that the present state of the classification of Asteroids is not as satisfactory as one would hope to find it after the labours of two industrious zoologists for five or more years, and that *Odontaster* is sufficient to prove that no classification can be satisfactory which allows of a wide gap between the Archasteridæ and the Pentagonasteridæ.

A list of the species of *Odontaster* with the synonyms may be useful.

ODONTASTER.

Odontaster, Verrill, Am. J. Sci. xx. (1880) p. 402.
Gnathaster, Sladen, Chall. Rep. Ast. (1889) p. 285.
Asterodon, Perrier, Miss. Cap Horn, Echinodermes (1891), p. K. 132.

1. ODONTASTER BELLI.

Pentagonaster belli, Studer, Anhang zu Abh. k. Akad. Wiss. Berlin, 1884 (1885), p. 31.

Prof. Perrier thinks this may be a synonym of *Odontaster singularis*, but the ventral plates of that species are in no way paxilliform; the adambulacral spine of *O. belli* appears to be specially modified, and in the distal fourth of the arm the intermediate actinal plates are wanting. For these reasons separation appears to be, at present, the safe course.

2. ODONTASTER DILATATUS.

Pentagonaster dilatatus, Perrier, Arch. Zool. expér. v. (1876) p. 33.
Gnathaster dilatatus, Sladen, Chall. Rep. Ast. (1889) p. 750.

[1] May I take this opportunity of remarking that "paxilli," and not "paxillæ," is the correct form of the name of these plates?

3. Odontaster elongatus.

Gnathaster elongatus, Sladen, Chall. Rep. Ast. (1889) p. 288.

4. Odontaster granulosus.

Asterodon granulosus, Perrier, Miss. Cap Horn (1890), p. K. 132.

But for its pedicellariæ this species is very close to *O. singularis*.

5. Odontaster grayi.

Calliderma grayi, Bell, P. Z. S. 1881, p. 95.

Pentagonaster paxillosus, id. (not Gray) *t. c.* p. 95.

Gnathaster grayi, Sladen, Chall. Rep. Ast. (1889) p. 750.

Asterodon pedicellaris (pars), Perrier, Echinod. Miss. Cap Horn (1891), p. K. 135.

Asterodon grayi, id. *t. c.* p. K. 138.

After a very careful and detailed examination of the descriptions and the specimens at my disposal, I have come to the conclusion that :—

(1) What in 1881 I called the young of *Pentagonaster paxillosus*, Gray, is not so, for *P. paxillosus* has two long (? glassy) spines at each oral angle, while the Magellan specimen has but one.

(2) *P. paxillosus*, Bell (1881), is clearly the same as those specimens of *Asterodon pedicellaris* which have not the remarkable "pedicellariæ" said by M. Perrier to be found in some members of that species, with regard to which I should be glad of more detailed examination; and I give, therefore, the synonymy as above.

(3) M. Perrier's account of his example of "*Calliderma grayi*," which is larger than the two small specimens in the British Museum, is sufficient to assure me that we have here to do with one species under three specific and three generic names !

(4) A comparison of the original of Mr. Edgar Smith's *Pentagonaster meridionalis* with M. Perrier's descriptions shows that there is no reason whatever for regarding it as synonymous with *A. pedicellaris*. The last-named species appears to me to be divisible into two ; so far as I can form a mental picture of the "pedicellariæ" described by Prof. Perrier, their presence or absence is a point of sufficient importance to justify specific distinction. With regard to *O. meridionalis*, Mr. Smith is not affected by the complaint of M. Perrier that he "ne signale pas" the remarkable pedicellariæ, for they are not present on the specimen which formed the basis of his description. On the other hand, Mr. Sladen is quite correct in pointing out that there are no pedicellariæ on the upper surface of the same specimen.

6. Odontaster hispidus.

Odontaster hispidus, Verrill, Am. J. Sci. xx. (1880) p. 402.

7. Odontaster meridionalis.

Astrogonium meridionale, E. A. Smith, Ann. & Mag. Nat. Hist. xvii. (1876) p. 109.

Pentagonaster meridionalis, id. Phil. Trans. 168. (1879) p. 276.
Gnathaster meridionalis, Sladen, Chall. Rep. Ast. (1889) p. 287.
Gnathaster pilulatus, id. *t. c.* p. 292.

8. ODONTASTER MILIARIS.

Astrogonium miliare, Gray, P. Z. S. 1847, p. 79.
Gnathaster miliaris, Sladen, Chall. Rep. Ast. (1889) p. 750.

I include this species on Mr. Sladen's authority; the only specimen of it that I have seen, that described by Dr. Gray, has the mouth-parts so poorly preserved that I cannot say whether or no it had the spines which are characteristic of this genus.

9. ODONTASTER PAXILLOSUS.

Astrogonium paxillosum, Gray, P. Z. S. 1847, p. 79.
Gnathaster paxillosus, Sladen, Chall. Rep. Ast. (1889) p. 750.

10. ODONTASTER PEDICELLARIS.

Asterodon pedicellaris, Perrier, Miss. Cap Horn (1891), p. K. 135.

For the limits of this species, see the remarks under *O. grayi*.

11. ODONTASTER SINGULARIS.

Goniodiscus singularis, M. Tr., Arch. f. Nat. 1843, p. 116.
Pentagonaster singularis, Perrier, Arch. Zool. expér. v. (1876) p. 38.
Gnathaster singularis, Sladen, Chall. Rep. Ast. (1889) p. 750.
Asterodon singularis, Perrier, Miss. Cap Horn (1891), p. K. 134.

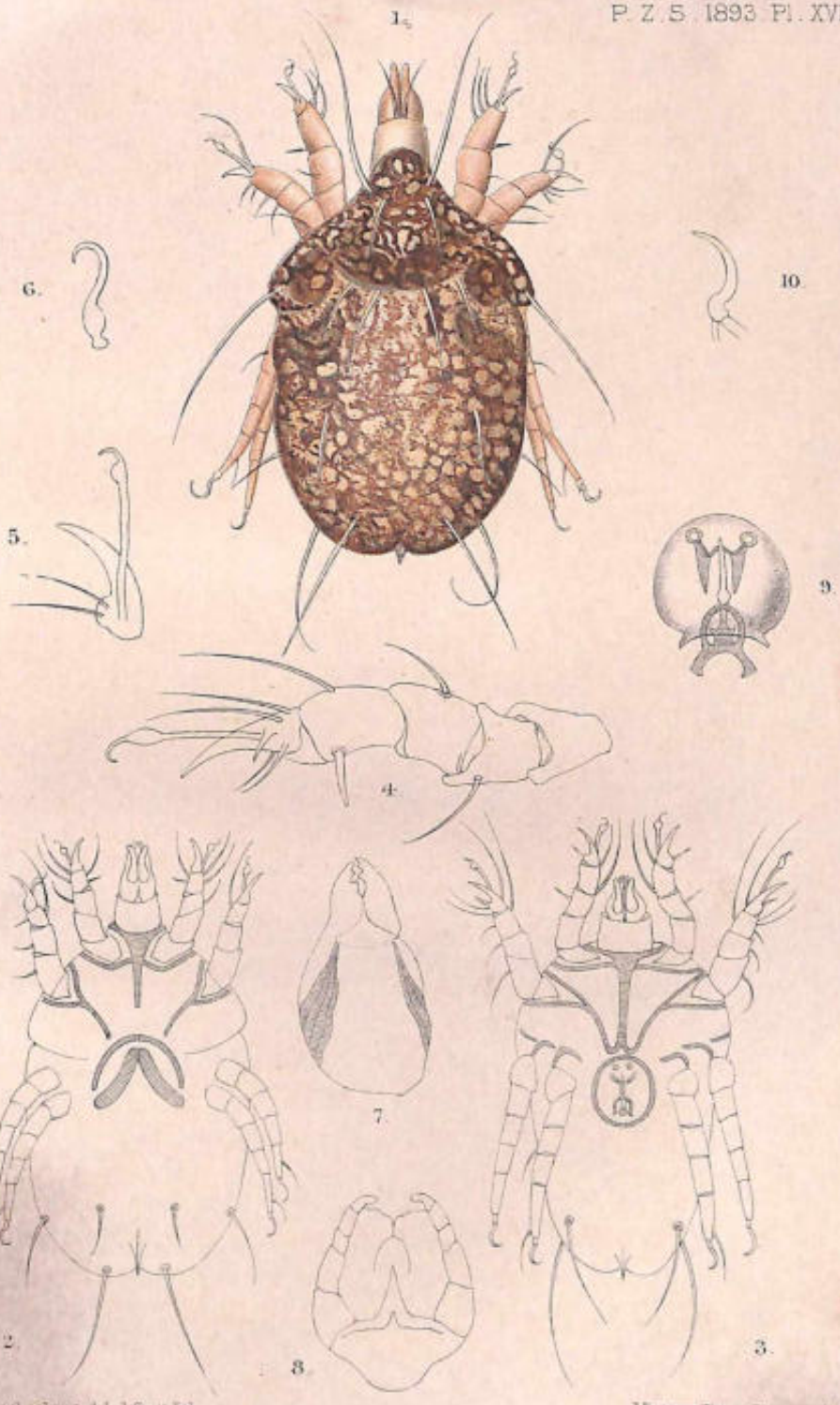
Mr. Sladen includes *Goniodiscus verrucosus*, Phil., under *Gnathaster* with a sign of doubt.

4. On a new Genus and Species of *Acari* found in Cornwall. By A. D. MICHAEL, F.L.S., F.Z.S., P.R.M.S., &c.

[Received March 11, 1893.]

(Plate XVIII.)

In November 1892 I was staying near the Land's End, Cornwall: in one of the small rocky bays which are found along this granite coast a little stream of fresh water comes down from the cliffs in the middle of the bay; at the edge of the stream, where it only trickled, and near enough to the sea to be within the influence of wind-carried spray, some considerable patches of the small green water-weed *Cladophora fracta* were growing. Amongst this weed I found examples of several species of Acarina, and was taking the



A. D. Michael, ad nat. del. J. Smit, lith.

Mintern Bros. Chromo. lith.

LENTUNGULA ALGIVORANS *N.S.*

opportunity of studying the anatomy of two of these species. For this purpose I required frequent fresh supplies of the creatures, but, unfortunately, before I had completed my investigations, a two days' storm of violent rain and wind came, and when I revisited the stream I found almost all the alga washed away and not an *Acarus* left in what remained. Under these circumstances I began to search for other patches of the *Cladophora*, and found a largish quantity growing on the face of the cliff near the horn of the bay, in a place somewhat difficult of access, nearer to the sea than the other, but higher up the cliff; a very thin thread of fresh water trickled down the cliff here, keeping the alga moist, and the spray of the sea would dash there in rough weather, and probably more or less would be carried there whenever the wind was from the sea, its most frequent direction. It was a warm corner facing south. The weed was abundant and in good condition, having been protected from the storm; but, to my surprise, I did not find in it a single specimen of either of the species which I was looking for, but, on the other hand, I did find examples of two other totally distinct species which I had not ever before found in the *Cladophora* either at the stream in the middle of the bay or elsewhere. The first was in great numbers and in all stages; it was one of the Halicaridæ.

More careful examination with a microscope disclosed that there was also a second and much smaller species present in considerable numbers; it is, I believe, unknown, and the object of this paper is to record it. The creature, in spite of its minute size, has structural peculiarities which seem to me to render it particularly interesting. It belongs to the family Tyroglyphidæ. I thought at first that I had a new species of the genus *Hericia*, and that genus is certainly its nearest ally; but it is not possible to include it in that or any other existing genus. The great and singular difference of the two front pairs of tarsi and claws, the different position of the anus, and the absence of the strong sexual dimorphism found in *Hericia*, besides other points, distinguish it from that genus. There is only one recorded species of *Hericia*, viz. *H. robini* (Canestrini ex Robin), a very singular creature of a flattened diamond-shape (the male especially) which wades in the sap which exudes from elm-trees where the bark has split. The present species shares the flattened diamond-shape and the wading habits of *H. robini*, although the habitat is so very different.

The great peculiarity and interest of the present species consists in the tarsi and claws. The Tyroglyphidæ usually have rather slender tarsi and from the actual end of each tarsus springs a single claw either with or without a caruncle: where the caruncle is present the claw is usually small; where it is absent, as in the genus *Hericia*, the claw is usually larger and more powerful. The claw generally consists of hard colourless chitin, and is a strongly curved hook with a very short, straight, hard, and solid peduncle, at the proximal end of which a small ball-like swelling serves to give attachment to tendons. Hook, peduncle, and ball

are all in one piece and quite hard and stiff; all the claws of *Hericia* are of this nature. The two hind pairs of legs of the present species have tarsi and claws fairly similar to those of *Hericia*, except that the shaft is a little more bulbous; the claws are large, of the ordinary type, and spring from the ends of the tarsi. The two front pairs of legs have an entirely different termination; the tarsi are very powerful, strongly curved downward, particularly at the distal end, and formed of stronger and denser chitin than the rest of the legs; they end in blunt points, and have the appearance of the dactylopodite in some Crustaceans. They form efficient climbing-organs, and the *Acarus* practically climbs entirely by their aid. I watched it climbing some dozens of times; it got the curved ends of its tarsi on to or over the edges of small pieces of stone or weed, and clinging to these slowly dragged itself up. From the side, not the end, of each tarsus springs a long, hyaline, slender peduncle, which projects considerably beyond the tarsus; this peduncle is flexible in all directions—not in the sense that it yields when it touches anything, for in effect it seldom does touch anything except very lightly, but in the sense that it has special motion of its own and can be flexed and turned in any direction at the will of the creature; indeed, it is almost constantly in motion. The distal end of this peduncle swells suddenly and forms a bulb, at the end of which is a very minute claw; the bulb can be turned upward and downward, carrying the claw, but the claw has not any motion separate from the bulb. This claw and peduncle are not used in clinging or walking at all; they seem to have become wholly tactile organs; the creature clings with the tarsus and then appears to feel about with the claw by turning and bending its flexible peduncle in all directions until it finds a suitable place to put the tarsus for the next step, then it moves the tarsus and the process recommences, being of course done by opposite legs alternately. I am not aware of anything at all similar in the structure and habits of any of the Acarina. I propose calling the genus "*Lentungula*," and the species *L. algivorans*.

Genus Lentungula[1].

Tyroglyphidæ without marked sexual dimorphism; with the body flattened dorso-ventrally; with the tarsi of the two front pairs of legs strongly curved, gradually diminished, ending in points, and used as climbing-organs. The claws of the same pairs of legs minute and mounted on long flexible peduncles springing from the sides of the tarsi and capable of being flexed at the will of the creature. Tarsi of two hind pairs of legs of the ordinary type, ending in large single claws without caruncles. With terminal anus formed of two upright plates lying against each other. Genital aperture in both sexes near the middle of the body between the coxæ of the fourth pair of legs.

[1] *Lentus*, flexible; *ungula*, a little claw.

LENTUNGULA ALGIVORANS. (Plate XVIII.)

Average length without mandible about ·38 mm.
Greatest breadth about ·20 mm.
Length of legs 1st pair about ·13 mm.
" " 2nd " " ·14 mm.
" " 3rd " " ·15 mm.
" " 4th " " ·15 mm.

Colour.—The actual colour of the creature, if it had been fasting for a long time, would probably be almost entirely light yellowish, but as ordinarily seen it is dark olive-brown with very numerous light yellowish spots and markings. The yellowish colour is chiefly in spots and spaces surrounded with the olive, but the spots are not arranged in any definite pattern; although a few spots on the cephalothorax have a tendency to be permanent, the whole of the markings are most irregular and varying. The olive-brown colour greatly predominates, and some specimens are almost wholly of that tint. The colour apparently arises from the diffusion of food material or products, it is not pigment in the cuticle; this can be demonstrated by placing a dark specimen in a drop of water on a glass slip under the microscope and placing a cover-glass over it; as the water evaporates the cover will be slowly drawn down, producing pressure upon the creature; the result of this will be that what appears like the whole contents of the body are gradually discharged from the anus, and the opaque dark creature becomes yellowish white and transparent. During life the brown colour does not, however, look like food-contents, it has every appearance of being the true colour of the greater part of the body. The rostrum and legs are always pale pinkish yellow.

Texture polished.

Shape.—This also depends considerably upon whether the creature is fully fed; when it is so the distinctive form is lost, and the *Acarus* becomes almost a roll with little shape in it, but when not quite so fully fed the form is rather striking. The cephalothorax is slightly broader than the abdomen, but much thinner dorso-ventrally, so that where the two join the dorsum of the abdomen stands high above the cephalothorax. There is a sharp indentation in the lateral edge of the creature, where cephalothorax and abdomen join; behind this the abdomen of the female is almost sack-shaped; that of the male narrows a little more posteriorly; in both sexes the hind margin is indented in the middle, so that each side forms a rounded lobe.

Cephalothorax.—The rostrum is a smooth tube or collar, long for the family; the strong chelate mandibles project considerably; each arm of the chela is tridentate (fig. 7). The five-jointed palpi (fig. 8), of the ordinary type, are adherent to the membranous maxillary lip, in the centre of and below which is a chitinous triangular sclerite which might possibly be considered to represent a labium. The central portion of the cephalothorax, behind the rostral tube, forms a large, rounded, fleshy lobe which overhangs the

rostrum. The hinder part of the cephalothorax widens greatly, its edge being the double curve known as the line of beauty. This edge is formed by a large raised roll; the median portion of the cephalothorax is also raised, but between the two, in the hinder part of the cephalothorax, is a large, shallow depression or dimple. There are a pair of hairs close together near the anterior edge of the rostral tube. On each side there is a very long hair near the edge of the body a little in front of the first leg, a similar hair near the posterior corner of the cephalothorax, and a shorter one about midway between them, also one pair on the dorsum of the cephalothorax; these, and all other hairs on the creature are simple and setiform.

Abdomen.—The anterior edge (progaster) has a somewhat exceptional form; the central portion (about half the width) projects boldly into the cephalothorax, is concave anteriorly, and runs out laterally so as to form a short horn or point. From the central projection the line on each side of the body runs back at an angle, but this portion also is concave anteriorly; it forms a raised roll with a large shallow depression or dimple behind it like that on the cephalothorax. When the creature is very fully fed all these depressions vanish, they also disappear after death. There are two pairs of hairs on the central projection of the progaster, the inner pair are the longer. There are also two other pairs of hairs on the notogaster (the hinder the longer), and two hairs on each lateral edge (the hinder the longer). The anus forms a short, median, posterior projecting point when seen from above, but a long slit when seen from the ventral surface; it is formed of two thin blades on edge lying close against each other, but capable of being separated widely posteriorly.

Underside (figs. 2 and 3).—The sternum is a triangular plate sending out band-like projections on each side parallel to the edge of the rostral collar, and a similar but straight piece posteriorly in the median line; this is longer in the male than the female. The epimera of the first pair of legs are formed by the lateral projections of the sternum and a branch arising from the sternum and passing behind the legs. Those of the second pair of legs are somewhat Y-shaped sclerites, which in the male are joined at their posterior ends to the posterior end of the sternum by short cross pieces. In the female they are wider apart and not attached. The epimera of the third and fourth legs are short right-angled pieces in the male. The vulva is between the two posterior pairs of legs; but advances more forward than the insertion of the legs; it is protected anteriorly by a large semi-annular sternite, and has well-marked chitinous labia. The male organ (fig. 9) lies rather further back; it is protected by a slightly elliptical (almost circular) plate, slightly truncated behind. This plate covers the longish curved penis (fig. 10) and the somewhat elaborate skeleton which supports it (fig. 9). This consists of a horseshoe-shaped sclerite with thick projecting posterior ends joined by a broad band, from a central projection of which the penis arises; the anterior end of

the organ, when at rest, is supported in a notch formed by two short rods attached to triangular blade-like sclerites on edge.

The legs are short, the posterior pairs not reaching the hind margin of the body; the two front pairs are almost blade-like, so that when seen on edge they appear almost linear, but they are rarely seen in this position; they are usually turned at an angle so that the side is partly seen, and thus they look very broad; they are much curved. The only remarkable feature is the tarsus (fig. 5), which in these two pairs is strongly curved and bluntly pointed, so that the whole joint forms a great claw, and it is by this that the creature climbs. It, however, is not the true claw, that exists in addition; from the side, not the end, of the claw-like tarsus springs a fine transparent, flexible tube which projects considerably beyond the tarsus; this tube ends distally in a small hollow ball, from which the very minute, but perfectly distinct, real claw arises. The tube can be flexed in almost any direction at the will of the creature; the ball also is capable of separate articulate motion upon the tube, but the claw does not seem capable of movement separately from the ball. I have not seen this apparatus used in clinging, but it is in continual special movement as the creature moves or feels about. It would seem to have become a tactile organ or one for collecting food. There is a short curved spine on the underside of the tarsus, a strong spike on the underside of the tibia, and some hairs, the arrangement of which may be seen from the drawings. The two posterior pairs of legs are quite different from the anterior: they are ordinary rounded legs, rather small, without any special feature; the tarsi are of the ordinary nature, and are terminated by large, single, curved claws (fig. 6).

Habitat. I found numerous specimens in a patch of green alga (*Cladophora fracta*) growing where the fresh water of a small stream trickled over the face of the granite cliffs within reach of the spray of the sea, near the Land's End, Cornwall. I have not found it elsewhere.

EXPLANATION OF PLATE XVIII.

All the figures represent *Lentungula algivorans*.

Fig. 1. Adult ♀ seen from above, ×150.
2. Adult ♀ seen from below, ×150.
3. Adult ♂ seen from below, ×150.
4. Second left leg (drawn from the ♂, but similar in both sexes), side view, ×320.
5. Tarsus of 1st left leg, ×320.
6. Claw of 4th leg (drawn from ♂, but sexes similar), ×320.
7. Left mandible of ♀ seen from the inner side, ×320.
8. Maxillary lip, palpi, and (?) labium seen from below, ×320.
9. Penis and penial skeleton and sclerites seen from below, ×320.
10. Penis seen from the side, ×320.

5. Notes on Variation and Development of the Vertebral and Limb-Skeleton of the Amphibia. By G. B. Howes, F.L.S., F.Z.S., Assistant-Professor of Zoology, R. Coll. Sci. Lond.

[Received March 14, 1893.]

Vertebral Column.—Numerical variation of the vertebræ of Amphibia has been from time to time recorded by various authors, and in dealing with the living Anura, Adolphi, as the result of a recent extensive enquiry [1], has been enabled to classify the types of variation met with into three orders, as chiefly determined by the fusion of adjacent vertebræ throughout this or that definitely restricted region. There has recently come into my possession the skeleton of an edible Frog (*Rana esculenta*) in which (fig. 1 *a*) the eighth and ninth vertebræ were immovably united; and although this union is in itself an apparently trivial matter, the fact that Adolphi found but one such case in 212 individuals of the Toad (*Bufo* var.) specially examined [2], is sufficient testimony to the rareness of the occurrence to warrant its being placed on record. So far as I am aware, Adolphi's example and those herein recorded are the only ones in which this particular fusion has been yet described, the majority of recorded variations having chiefly involved the head of the urostyle and sacrum. Rare as the fusion of the terminal vertebræ of the living Anura would thus appear to be, it is a remarkable circumstance that Walterstorff, who has shown [3] the Tertiary genus *Palæobatrachus* to be possessed of a compound sacrum of usually three vertebræ, regards the fusion of these as normal and characteristic of the genus.

On general morphological grounds there is good reason, as need hardly be pointed out, for associating the compound sacrum and the fusion of the sacral vertebræ together; and it might therefore reasonably be expected that in the Frog herein described (figs. 1 *a*, 1 *b*) a second sacral transverse process should appear on one or both sides. Such, however, was not the case; for the transverse processes of the last two vertebræ were in no way exceptional either in disposition or relationship. This is the more remarkable, as the 8th vertebra of this animal is known to occasionally enter into the composition of the sacrum on one or both sides, while still free and independent. In the Toad described by Adolphi [4], the Palæobatrachoid condition was much more nearly realized, as the fusion had involved the transverse processes of the 8th and 9th

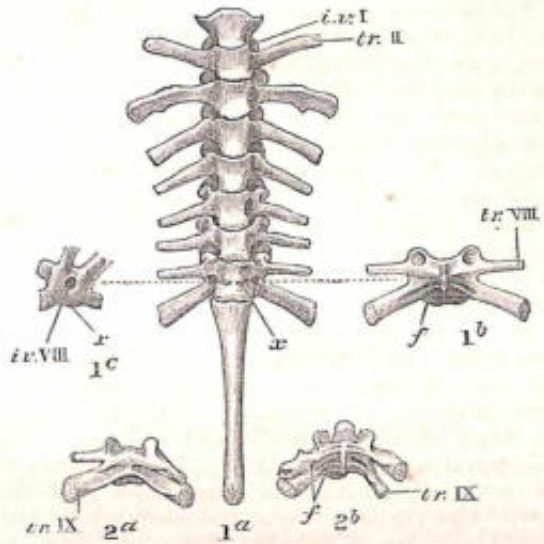
[1] Morpholg. Jahrb. Bd. xix. pp. 331–375. As this author's list of references is incomplete, the contributions of Sasserno and others having been apparently overlooked, I am compelled to refer the reader to an earlier paper of my own (Journ. Anat. & Phys. vol. 24. p. xvi app.) for a full record up to the time of writing.

[2] *Loc. cit.* p. 351.

[3] Jahrb. naturwiss. Vereins, Magdeburg, 1885–86.

[4] *Loc. cit.* p. 366, pl. xii. fig. 4.

vertebræ on the right side. On searching through an accumulation of Frogs' bones in my possession, I found a specimen (fig. 2 *b*) which, except for certain subtle and altogether unimportant differences of an adaptive nature, closely parallels Adolphi's Toad; and I am indebted to my demonstrator, Mr. M. F. Woodward, for a backbone in which the opposite (left) side, instead of the



Vertebral column of *Rana esculenta*.

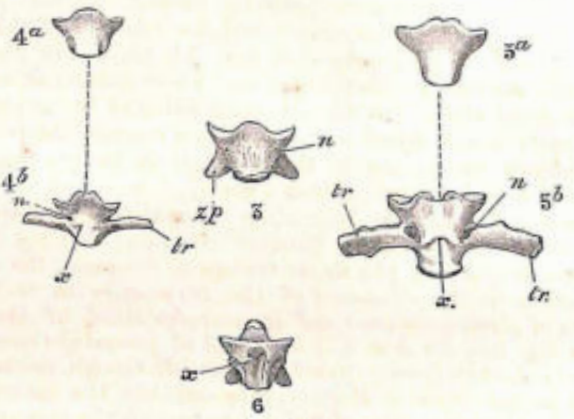
Fig. 1 *a*. The vertebral column of an individual in which the last two vertebræ had completely united, ventral aspect. Fig. 1 *b*. The united 8th and 9th vertebræ of the same, dorsal aspect. Fig. 1 *c*. The same, lateral aspect. Fig. 2 *a*. The correspondingly united 8th and 9th vertebræ of another individual, having a compound sacrum on the left side. Fig. 2 *b*. A similar case to 2 *a*, but with the compound sacrum on the opposite side. 2 *a* and 2 *b*, dorsal aspect. All 1½ nat. size.

f, furrow, denoting the point of fusion of adjacent parts; *i.v*, intervertebral foramen; *tr*, transverse process; *x*, eminence at the point of fusion of adjacent vertebral bodies.

right, was similarly modified (fig. 2 *a*). In his specimen the 9th transverse process furnished the sacral articulation on the non-affected side, as with Adolphi's Toad; while in my own (fig. 2 *b*) the eighth fulfilled that function.

Except for a relative diminution in the length of its urostyle, and for the fusion of parts already referred to, the Frog's backbone first described (fig. 1 *a*) was in no respect structurally abnormal. Its anterior three vertebræ were, however, far less freely movable than is normally the case; and in this they anticipate as it were the greater fusion of these bodies so frequently met with in *Ceratophrys*

and certain other genera, and the more regular if not diagnostic ankylosis of the first two vertebræ of the living *Pipa*, *Xenopus*, *Pelobates*[1], and others, and of the extinct *Palæobatrachus*[2]. The fact that *Ceratophrys* and *Pelobates*, in which this tendency towards a greater fusion is well marked, are possessed of a relatively short



So-called atlas of *Rana* and *Siredon*.

Fig. 3. The so-called atlas of *Rana macrodon*, exceptional. Fig. 4. The so-called atlas of *Rana esculenta*: *a*, normal; *b*, exceptional. Fig. 5. The same in *Rana catesbiana*: *a*, normal; *b*, exceptional. Fig. 6. The same in the Mexican Axolotl, *Siredon pisciformis*. All from the ventral aspect. Figs. 3, 4, and 6 enlarged.

n, nerve-aperture for exit of trans-atlantal nerve; *tr*, transverse process; *x*, eminence at point of fusion of adjacent vertebral bodies.

urostyle, invests the aforenamed anticipation with an amount of interest, by way of suggesting that the reduction in length of the urostyle and the vertebral ankylosis may be associated modifications.

In the majority of Anuran skeletons that I have examined, in which co-ossification of adjacent vertebræ had been effected, all traces of their original lines of demarcation were lost on the ventral surface, the centra passing insensibly into one another. In the Frog first described this was otherwise, for its vertebral column when viewed from beneath (fig. 1 *a*) or from the side (fig. 1 *c*), revealed a couple of eminences (*x*) at the point of fusion of the two terminal vertebræ.

There is no variation to which the Amphibian vertebral column

[1] *Cf.* Hoffmann, in Bronn's Klassen und Ordnung. d. Thier-Reichs, "Amphibien," (Bd. vi.) p. 57.

[2] *Cf.* Walterstorff, *op. cit.*, and Adolphi, *loc. cit.* p. 362. I have observed a similar fusion of the first two vertebræ in individuals of *Rana guppyi* and *R. catesbiana*.

is liable at all approximate in interest to that of the occasional appearance of transverse processes on the first vertebra; but, with the exception of a casual mention of a case in *Rana esculenta* by A. G. Bourne[1], it has remained unnoticed. His specimen was very abnormal in other respects; but I am in possession of two backbones of the same species in which, while the last eight vertebræ were perfectly normal, the first one or "atlas" bore transverse processes, and, in addition (fig. 4 *b*), a pair of lateral perforations (*a* of figs. 4 *b*, 10, & 11) disposed serially with the intervertebral foramina. These specimens reached me in the dried state; but careful examination of the remains of the soft parts which lay about one of them revealed the presence of nerve-fibres within one of the perforations in question, and thus proved it to have transmitted a nerve.

On seeking for further light upon this variation, I have dissected certain of the larger Ranoids[2] in vain; but my friend Prof. Chas. Stewart, of the Royal College of Surgeons, has called my attention to the existence of the nerve-exits in the only specimens of *Rana catesbiana* and *R. macrodon* which his Museum possesses (*cf.* figs. 5 *b* & 9, & 3 & 8), and of powerful transverse processes in the first species named. Strangely enough, neither the skeletons in the Natural History Museum, nor the carcases of these species therein preserved which I have had the opportunity of dissecting[3], reveal the remotest traces of either the one or the other.

Hyrtl called attention twenty-eight years ago, in his celebrated Monograph on the Japanese Salamander (*Megalobatrachus* [*Cryptobranchus*] *japonicus*), to the existence of a spinal nerve which perforated the arch of the "atlas;" and Humphry, six years later, described the nerve more fully[4] as the "sub-occipital," tracing it to a distribution to the "foremost portion of the sub-vertebral rectus" muscle. Fischer had (in 1864) already described a similar nerve[5] in *Menobranchus*, believing it to be peculiar to that animal among Urodeles; and it is interesting to note that he traced it to a distribution in the "occipitalis minor" muscle. Hyrtl, in accordance with the facts of the case, was led to regard the so-called "atlas" of the Amphibia as a product of fusion of the "atlas and epistropheus" of the higher Vertebrata; but this revolutionary conception has been almost lost sight of, except for its acceptation by Hoffmann[6] and so far as the work of Albrecht[7] and Stöhr[8], alluded to below, may bear upon it. Neither it nor any facts concerning

[1] Quart. Journ. Micr. Sci. vol. xxiv. p. 86.

[2] *Calyptocephalus grayi*, *Leptodactylus pentadactylus*, and *Rana guppyi*.

[3] For permission to do this my best thanks are tendered to Dr. A. Günther, F.R.S., and my friend Mr. G. A. Boulenger.

[4] Journ. Anat. & Phys. vol. vi. p. 48 (1870).

[5] 'Anat. Abhandlg. ü. d. Perennibranchiaten und Derotremen,' Hft. i. p. 158 (Hamburg, 1864).

[6] Bronn's Thier-Reich, Bd. vi. p. 54.

[7] Zool. Anz. 1880, p. 477.

[8] Zeitschr. f. wiss. Zool. Bd. xxxiii. p. 477, and Bd. xxxvi. p. 68.

it are alluded to in Cope's recent 'Batrachia of North America'[1], except that he refers to the odontoid process of the Urodela (p. 29) as the "body of the pro-atlas;" Adolphi is silent on the topic, assuming the "sub-occipital" nerve to be absent in all Anura[2]; while Fürbringer, in a laborious investigation into the comparative anatomy of the shoulder-muscles, has recorded[3] his inability to find a nerve either passing between the skull and the first vertebra or perforating the arch of the latter, in any Anuran which he dissected (*Pipa* excepted).

Not the least interesting feature in the transverse-process bearing "atlas" of *Rana catesbiana* (fig. 5 *b*) and *R. esculenta* (fig. 4 *b*) is the presence on the under surface of each of a couple of eminences, well-nigh indistinguishable from those present in the specimen herein described (fig. 1 *a*) at the point of fusion of the 8th and 9th vertebræ (*x*). *Rana macrodon* reveals no such peculiarity (fig. 3), but in the Axolotl, in which also I find a "sub-occipital" nerve may be present, a deep lyriform depression occurs at the corresponding point (*x*, fig. 6), bounded in front by a median tuberosity. While, on exclusively anatomical grounds, these points of similarity support the principle of Hyrtl's conclusion, the facts of comparative morphology[4] that have in recent years shown the hypoglossus nerve-bearing region to be incorporated in the occiput of the Amniota, together with those which are rendering it more and more clear that the os odontoideum of these animals is a true centrum, and the so-called "body" of their atlas an intercentrum[5], forbid further comparison between the "atlas" of the Amphibia and either the atlas or epistropheus of the higher Vertebrata.

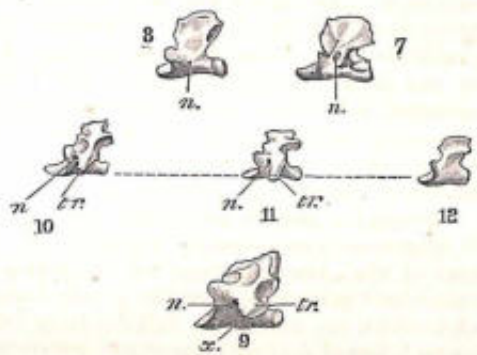
The nerve passing through the arch of the "atlas" in some Urodela conforms, so far as is known, to the characters of a true spinal nerve; as described by Humphry in *Megalobatrachus*, it has the relations rather of a ventral than a dorsal ramus of a typical nerve of the trunk; while, as described by Fischer for *Menobranchus*, the reverse would appear to hold good. Prof. Stewart informs me that in *Rana catesbiana* (the "atlas" of which is herein figured) he traced it to the muscles of the hyoid region.

Stöhr has recently shown[6] that the odontoid process of the Amphibian (*Triton*) is a primarily independent derivative of the cranial notochord; and he lays much stress[7] upon the conclusion that the homologues of the hypoglossus and accessorius nerves of the higher Vertebrata are to be sought in the anterior spinal nerves of the lower ones. If this be accepted, the known

[1] Bull. U.S. Nat. Mus. no. 34 (1889).
[2] *Loc. cit.* p. 316.
[3] Jenaische Zeitschr. Bd. vii. p. 286 (1873), and Bd. viii. p. 180 (*cf.* v. Ihering, *infra*, p. 273).
[4] For a *résumé* of these see P. Z. S. 1890, p. 358.
[5] *Cf.* especially Baur, Biolog. Centralbl. Bd. vi. p. 359, and Boulenger, Ann. & Mag. Nat. Hist. ser. 6, vol. iii. p. 140.
[6] Zeitschr. f. wiss. Zool. Bd. xxxvi. p. 90.
[7] *Ibid.* Bd. xxxiii. p. 518.

facts of morphology of the occipital and anterior-vertebral regions of the vertebrate body raise the question whether in the so-called "atlas" of Amphibians we may not be dealing with the variously modified homologues of at least a couple of vertebræ, the formative blastema of which has in the Amniota become merged in the occiput.

Von Ihering has adduced [1] reason for believing that the numerical reduction of the vertebræ of *Pipa* to 8 is due to "excalation" of the second vertebra, as normally enumerated in other forms; and the facts recorded by Portis [2] for certain of the Tertiary Anura go far towards proving that the near ancestors of the



So-called atlas of *Siredon* and *Rana*.

Fig. 7. The so-called atlas of the Mexican Axolotl, *Siredon pisciformis*, from the side. Fig. 8. The same in *Rana macrodon*, exceptional. Fig. 9. The same in *Rana catesbiana*, exceptional. Figs. 10 & 11. The same in *Rana esculenta*, showing degrees in the occlusion of the foramen of exit of the trans-atlantal nerve. Fig. 12. The same in *R. esculenta*, normal. Figs. 7, 8, 10–12 enlarged.

References as for figs. 3 to 6.

living Anura possessed more than nine free vertebræ. While in one of the two transverse-process bearing Frogs' atlases herein described the nerve foramina (*n*, fig. 10) were, like those of Prof. Stewart's *Rana catesbiana* (*n*, fig. 9), widely open, in the other (fig. 11) they were, as in his *R. macrodon* (fig. 8), minute and reduced almost to occlusion. The differences between the first and last named and the atlas of the normal or dominant type met with among Anura (ex. fig. 12) are precisely those which would be realized during the stages in suppression by fusion of a vertebral segment; and, in consideration more especially of the greater

[1] Morpholog. Jahrb. Bd. vi. p. 297 (1880); *cf.*, however, Adolphi, *loc. cit.* p. 315.

[2] Atti Accad. del. Sci. Torino, vol. xx. p. 1173 (1885).

and more regular development of the trans-atlantal or "sub-occipital" nerve in the Urodela, the facts point most markedly to the conclusion that the numerical reduction of the vertebræ of the Anura has been effected by something more than a mere shortening up from behind, as is customarily supposed [1].

The only alternative is a belief in a secondary origin of the occasionally transverse-process bearing half of the so-called "atlas," by subdivision of that vertebra; and, in view of Baur's recent argument [2] in favour of an intercalary origin of supernumerary vertebræ, it might be asked whether the extra atlantal vertebra occasionally present in the Anura might not represent this, in a completely dismembered form. The difficulties which beset this belief are so great, and the facts, at any rate in the case before us, point so very strongly in the opposite direction, that further discussion would be futile, until we know more than at present of the detailed nerve-relationships of such exceptional individuals as are herein dealt with.

The entire question of morphology of the Amphibian "atlas" needs to be worked over afresh, in both its anatomical and developmental aspects. As the case now stands, it suggests that that structure is a compound of at least two vertebræ, whose outstanding processes have disappeared under changes which have effected the loss of the so-called "sub-occipital" nerve and the occlusion of its exits.

The Urostyle.—Some months ago, while dissecting the remains of an Anuran Tadpole (? *Pelobates*), which I acquired from the effects of the late Prof. W. K. Parker, my attention became arrested by the detailed relationships of a median rod-like bony centre, lying within the sheath of the developing urostyle, at a point approximate to the last two ossifying vertebræ (*cf.* figs. 13 and 14, *cc*). The accepted views of the morphology of the Amphibian urostyle are based upon the researches of Dugès [3] and Gegenbaur [4]. These authors, together with Goette [5], have figured and described its leading developmental stages; and Dugès, referring to the rod in question as "une épine cylindroïde, d'abord cartilagineuse,"

[1] Schmidt's recent discovery (Zeitschr. f. wiss. Zool. Bd. liv. p. 748) of rudimentary arches to the caudal "pleurocentra" (Baur's "centra") of *Amia* appears to me to suggest that the remarkable condition of the vertebral skeleton of that animal, and certain Elasmobranchs (*cf.* Goette, *loc. cit.* p. 418, and Balfour, Comp. Emb. vol. ii. p. 553) among living fishes, is indicative of abbreviation and simplification, by reduction of alternate vertebræ with fusion of the skeletal parts remaining, akin to but more extensive than that which I herein claim for the Anurous Amphibia.

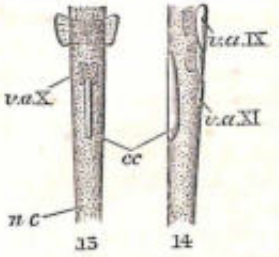
[2] Journal of Morph. vol. iv. p. 331; *cf.* also Parker, Phil. Trans. vol. 167. part 2. p. 575 footnote.

[3] 'Rech. sur l'Ostéologie et la Myologie d. Batraciens.' Paris, 1834.

[4] 'Untersuchung. z. vergleichend. Anat. d. Wirbelsäule b. Amphibien und Reptilien.' Leipzig, 1862.

[5] 'Die Entwickelungsgesch. d. Unke.' Leipzig, 1875.

has long ago worked out[1] its fundamental relationships during development to the remaining osseous elements entering into the composition of the adult urostyle.



Pelobates fuscus, coccygeal portion of developing vertebral column.

Fig. 13 in a Tadpole of 92 millim., from beneath.
Fig. 14 in an older Tadpole of 112 millim., from the side.

cc, urostyle; *nc*, notochord; *v.a.* IX–XI, vertebral arches. 2½ times nat. size.

In view of this, and of my tadpole proving to be a Pelobatoid, I eagerly availed myself of the beautiful preparations of the larval skeleton of *Pelobates fuscus* placed upon the market by Fritsch of Prague. Great was my delight to find that two of the three individuals purchased from him showed the ossification in question. This and certain other genera of living Anura are somewhat remarkable for the detailed mode of development of their vertebral bodies[2] and especially for the late appearance of their centra, those structures not being developed until the arches are in an advanced and directly articulated state. The rod above referred to (*cc*, fig. 14), which beyond doubt gives rise to at any rate the main portion of that which Goette calls[3] the periosteal component of the urostyle, arises in the interval of time between the formation of the ossific neural arches and their corresponding bony centra. The figures sufficiently show that it first appears beneath the 10th pair of arches as ordinarily enumerated (*v.a.* X), and that it elongates in a backward direction with the superaddition of the 11th pair (*v.a.* XI). There is thus recognizable at this period of growth a provisional inversion of the order of development of the parts—the ossific neural arches appearing before their corresponding centra and the ossific body of the urostyle arising prior to the first deposition of the last (11th) pair of arches, with which it subsequently first unites. In consideration of the conflicting opinions concerning the morphology of the "hypochordal" constituent of the urostyle[4], and especially of Goette's refusal to admit this homologous either with entire vertebræ or vertebral bodies[5], this

[1] *Loc. cit.* pp. 108–111.
[2] *Cf.* Balfour's 'Embryology,' vol. ii. p. 556.
[3] *Loc. cit.* p. 933, and pl. xi. fig. 196.
[4] *Cf.* Gegenbaur, *loc. cit.* pp. 32–33.
[5] *Loc. cit.* p. 393.

inversion in growth is interesting, as it tends to bring the Amphibian "coccyx" into closer harmony with that of the Mammal, in which (*Homo*)[1] ossification of the vertebral arches, unlike that which obtains in the pre-sacral region, is effected subsequently to that of their overlying centra[2].

It may be of interest here to recall the similarity in numerical reduction of the free vertebræ met with in the Anurous Amphibia (*Pipa* to 7) and the Teleostean Fishes (*Ostracion* to 14)[3]. In its occasionally rod-like character, the Teleostean "terminal vertebra" may so closely approximate to the condition of the Amphibian urostyle (ex. *Molva*) as to merit that title; and the enclosure within it of a cartilaginous urochord (ex. *Osmerus*) indicates a close parallelism of modification between the two great groups of Vertebrates, which calls for further investigation.

Cartier has directed attention[4] to an apparent similarity in the primary mode of origin of the vertebral bodies of Urodeles and Teleosteans; and the interest of the foregoing consideration is enhanced by the discovery by Emery[5] and Albrecht[6] of an odontoid vertebra of the Amphibian type in *Fierasfer*, *Pelamys*, and certain other bony fishes[7], and by the tendency towards a common type of fusion of vertebræ in the two great groups[8].

Pedal Skeleton.—An adult male of the Spotted Salamander (*S. maculosa*) has recently come into my hands in which the hind limb was exceptionally modified (figs. 15 & 16); and as it is the only one possessed of a reduced pedal skeleton out of some hundreds which have from time to time come under my notice, I conclude that the variation of the same is, in this animal, very rare.

The left hind limb (fig. 15) was in every respect normal; but the right one (fig. 16), when viewed externally, appeared to be tridactyle. The apparent three digits were less completely distinct from each other and less freely movable than those of the normal limb, and the presumed inner one (I, II), which was very short, and in transverse diameter equal to the other two combined, was more rigid than the rest of the limb and apparently of little service in progression. When the limb was brought to the ground,

[1] Especially when regarding as coccygeal those so-called sacral vertebræ which take no share in the formation of the iliac articulation.

[2] *Cf.* Quain's 'Anatomy,' ed. 9, pp. 20–22.

[3] Günther, 'Introd to Study of Fishes,' p. 686.

[4] Zeitschr. f. wiss. Zool. Bd. xxxv. (Sup.) p. 73; *cf.* also Goette, *loc. cit.* p. 415.

[5] Fauna u. Flora d. Golfes von Neapel, Monogr. ii. p. 26 (1880).

[6] *Loc. cit.* p. 472.

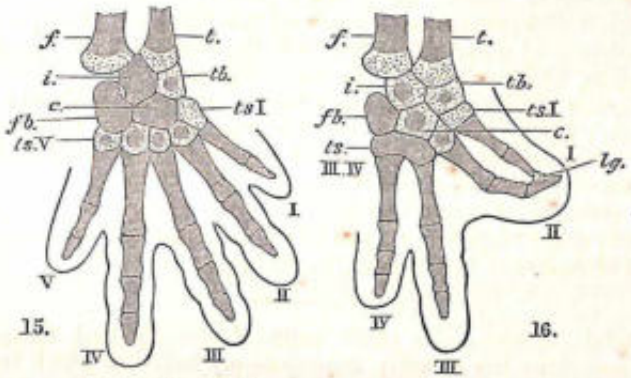
[7] The analogy, if worth anything, certainly does not bear out Jordan's recent suggestion (Proc. U. S. Nat. Mus. vol. xiv. p. 107) that this numerical reduction and its associated "ichthyization," as he somewhat fantastically terms it, take place in degree approximate to the approach to the equator.

[8] *Cf.* Schmidt, *loc. cit.* p. 757.

it was only possible for this to act as a support under undue extension of the two remaining digits.

On laying bare the enclosed skeleton, it was observed that muscular elements were largely wanting in relation to this presumed inner digit, and that that really represented the first and second digits, bound up in a kind of syndactyly. The second one (II, fig. 16) was abnormally bent upon itself in an inward direction, and its terminal phalanx was firmly united to the single one of the first digit by a powerful ligament (*lg*) which rendered independent movement of the parts impossible.

On turning to the rest of the limb-skeleton, the tibia and fibula



Hind limbs of *Salamandra maculosa*, adult ♂.

Fig. 15. Skeleton of left hind limb, ventral aspect. Fig. 16. The same, right hind limb, dorsal aspect, for comparison with its fellow. The contour-lines of the undissected limbs are indicated, and the darker areas delineate centres and degrees of ossification. 3 times nat. size.

c, centrale; *f*, fibula; *fb*, fibulare; *i*, intermedium; *lg*, ligamentous fibres; *t*, tibia; *tb*, tibiale; *ts* I–V, tarsalia; I–V, digits.

(*t*, *f*) and the metatarsals and phalanges of the three innermost digits were all normal in their relative sizes and degrees of ossification. The fourth digit, however, although possessed of its full complement of phalanges, instead of being the longest of the series, as is most generally the case in this species, had undergone an arrest of growth, whereby it remained much shorter than the third. The latter digit had, in fact, usurped its function; and comparison of the figures will show that the proportionate relationships between the 3rd and 4th digits of the reduced limb (fig. 16) were approximately those of the 4th and 5th of the normal one (fig. 15). There was no trace either of a fifth digit or of its related tarsale. The tarsal elements of the reduced limb, while fully represented for the digits present, were remarkable for the complete co-ossification of the 3rd and 4th tarsalia (*ts* III, IV, fig. 16). On further comparison with the normal tarsus, it was seen that all

the elements not directly related to the two digits (III & IV) which were alone normally functional were in a backwardly developed state, as though they had been subjected to an arrest in growth. This was especially the case with the intermedium (*i*) and centrale (*c*). That the departures from the normal here met with admit of ready explanation on purely physiological grounds is sufficiently clear; but the case is none the less interesting morphologically, as in those Urodeles possessed of numerically reduced digits both the reduction and fusion of all parts involved are invariably effected in a progressive manner from the post-axial or outer side inwards [1] and accompanied by a diminution in length of the outermost digit.

Numerical variation of the digits is most marked among the Amphiumidæ of all living Urodeles, the individual variations being such as to have led Cope to the conclusion [2] that *Amphiuma tridactyla* is but a variety of *A. means*, the digits of the species ranging from 1 to 3 in number in both fore and hind limbs. These facts, taken in conjunction with the recent discovery of a fleeting vestige of the pelvic member in one alone among a series of larvæ of *Ichthyophis glutinosa* examined by the cousins Sarasin [3], show that individual variations of the kind herein recorded may realize (admittedly in a perhaps distorted form at times) the steps by which the reduction and loss of limbs have been effected in allied genera and species.

March 28, 1893.

Sir W. H. Flower, K.C.B., LL.D., F.R.S., President, in the Chair.

Mr. Arthur Thomson, the Head Keeper, exhibited a series of Insects reared in the Insect-house in the Society's Gardens during the past year, and read the following Report on the subject:—

Report on the Insect-house for 1892.

Examples of the following species of Insects have been exhibited in the Insect-house during the past season:—

Silk-producing Bombyces and their Allies.

Indian.

Attacus atlas.
—— *cynthia.*
—— *pernyi.*
—— *roylei.*
Antheræa mylitta.
Actias selene.
Cricula trifenestrata.

[1] *Cf.* Baur, 'Beitr. z. Morphogenie d. Carpus und Tarsus.' Th. I. Batrachia. Jena, 1888.

[2] Proc. Amer. Phil. Soc. 1886, p. 526. *Cf.* also Hay, Amer. Nat. 1888, p. 315; and Cope, Batrachia of N. America, p. 218.

[3] Ergebnisse Naturwiss. Forschung. auf Ceylon, Bd. ii. Hft. 2, p. 22. Wiesbaden, 1887

Japanese.

**Caligula japonica.*

Australian.

**Caligula eucalypti.*

American.

Samia cecropia.
Telea polyphemus.
—— *promethea.*
Telea angulifera.
Hypochera io.
Actias luna.

Diurnal Lepidoptera.

European.

Papilio podalirius.
—— *machaon.*
—— *alexanor.*
Thais polyxena.
Parnassius apollo.
Lycæna corydon.
Vanessa levana.
Vanessa atalanta.
—— *io.*
—— *cardui.*
Argynnis aglaia.
Colias edusa.
Melanargia galathea.

American.

Papilio ajax.
—— *asterias.*
Papilio philenor.
Limenitis disippus.

Nocturnal Lepidoptera.

Smerinthus ocellatus.
—— *populi.*
**Deidamia inscripta.*
**Triptogon modesta.*
**Cressonia juglandis.*
**Paonias excæcatus.*
**Sphinx eremita.*
—— *ligustri.*
Deilephila euphorbiæ.
—— *galii.*
Chærocampa elpenor.
Macroglossa fuciformis.
Saturnia pyri.
—— *carpini.*
Eacles regalis.
—— *imperialis.*
**Anisota rubicunda.*
Clostera anachoreta.
Diphthera orion.

* Exhibited for the first time.

Of the insects which I have the honour to place before the Meeting this evening the following are exhibited for the first time, viz.:—*Caligula japonica*, *Caligula eucalypti*, *Deidamia inscripta*, *Triptogon modesta*, *Cressonia juglandis*, *Paonias excæcatus*, *Sphinx eremita*, and *Anisota rubicunda*.

The cocoons of *Caligula eucalypti* were sent from Australia by Mr. Le Souef, of the Zoological Gardens, Melbourne, and I hope to be able to get more, and to obtain the larvæ of this beautiful species.

Of the five species of American Sphingidæ exhibited for the first time, the specimens of *Triptogon modesta* are worthy of notice.

I exhibit this evening a fine male specimen of *Actias mimosæ*. This specimen emerged from one of three cocoons, deposited *this year* (1893) by the Hon. Walter Rothschild, F.Z.S., and, although I have had the cocoons on one occasion before, this is the first *perfect* specimen obtained.

The following papers were read:—

1. Descriptions of new Species of Lepidoptera Heterocera from Central and South America. By Herbert Druce, F.L.S., F.Z.S., &c.

[Received March 28, 1893.]

(Plates XIX.–XXI.)

The following descriptions of ninety-eight new species of Heterocera from tropical America represent twelve families, four subfamilies, and forty genera, two of which are new.

Many of the species of the Dioptidæ are of considerable interest, as they very closely resemble some of the butterflies belonging to the family Danainæ from the same localities. All the types are in my own collection.

Fam. Ægeriidæ.

Ægeria, Fabr.

Ægeria (?) ceraca, sp. n.

Primaries dark purplish brown, a streak from the base to the end of the cell hyaline, beyond the end of the cell a large golden yellow spot; the fringe dark brown. Secondaries hyaline, with the veins, outer margin, and fringe dark purplish black. Head and palpi black, the front of the head white, collar steel-blue; thorax dark brown; abdomen bright orange; the two anal segments and the tuft dark blackish brown; legs bluish black.

Expanse $1\frac{4}{10}$ inch.

Hab. British Guiana, Essequibo River (*Whitely*, *Mus. Druce*).

A fine distinct species quite unlike any other known to me. I have placed it in the genus *Ægeria* with considerable doubt.

Fam. Castniidæ.

Castnia, Fabr.

Castnia endelechia, sp. n.

Primaries pale brown, almost white along the inner margin, a short white streak near the base, and a white band crossing the wing beyond the middle, from the costal to the outer margin; the fringe pale brown. Secondaries pure white, the veins near the outer margin edged with bright red, a lunular-shaped black mark



W. Purkiss lith. Hanhart imp.

NEW SOUTH AMERICAN HETEROCERA.



W. Purkiss lith. Hanhart imp.

NEW SOUTH AMERICAN HETEROCERA.



W.Purkiss lith. Hanhart imp.

NEW SOUTH AMERICAN HETEROCERA.

at the end of the cell, thickly irrorated with red on the inner side, a round black spot near the apex, and a submarginal row of elongated spots edged with red on the inner edge; the outer margin and the veins black; the fringe pale brown. Underside similar to the upperside, but paler in colour and entirely without any red round the black markings. Head, thorax, and legs pale brown; abdomen greyish white. Antennæ wanting.

Expanse 3½ inches.

Hab. Argentine Republic, Corrientes (*Mus. D.*).

A very distinct species, allied to *C. eudesmia*, Gray.

Fam. Zygænidæ.

Autochloris, Hübn.

Autochloris oratha, sp. n.

Primaries deep black, the basal half of the wing hyaline, beyond which are square hyaline spots, the first close to the costal margin, the second below and nearer the anal angle. Secondaries black, with a round hyaline spot about the middle, and an oval hyaline spot on the inner margin close to the base. Underside the same as above, but paler in colour and with the costal margin of the secondaries from the base to near the apex bright metallic green. Antennæ and palpi black, front of head white. Head, thorax, and abdomen above deep black, the underside of the abdomen white. Tegulæ with a bright red spot at the base, and a bright red spot on each side of the abdomen close to the base.

Expanse 1$\frac{3}{10}$ inch.

Hab. British Guiana, Essequibo River (*Whitely, Mus. D.*).

This species is allied to *Autochloris varipes*, Walker, but can at once be distinguished from that species by its larger size, more hyaline wings, entirely black abdomen, red spots on the tegulæ and at the base of the abdomen.

Agyrta, Hübn.

Agyrta chena, sp. n.

Male. Primaries hyaline, the costal margin, apex, and inner margin broadly bordered with deep black, an oval white spot near the apex; a pale bluish-white streak extends along the inner margin from the base to the anal angle; the fringe black. Secondaries hyaline, the costal apex and outer margin broadly bordered with black, the inner margin bluish white. Underside very similar to the upperside, but without the bluish-white streak on the primaries. Antennæ and palpi black, front of the head, underside of the thorax, and abdomen white; legs greyish white on the upperside; back of the head and collar bright red; tegulæ black, edged with bluish white; thorax and abdomen dark blue, with a white line down the middle.

Expanse 1$\frac{3}{10}$ inch.

Hab. Upper Amazons (*Mus. D.*).

AGYRTA PANDEMIA, sp. n.

Male. Primaries black, the veins shot with bright blue near the base; a wide white band partly crosses the wing beyond the middle, from the costal margin to near the apex, but not reaching it. Secondaries hyaline; the costal margin, apex, and outer margin black shot with blue, the inner margin deep blue. The underside very similar to the upperside, but paler in colour. The head, antennæ, palpi, and thorax black; abdomen blue-black, the underside greyish white.

Expanse $1\frac{1}{4}$ inch.

Hab. Lower Amazons, Para (*Mus. D.*).

AGYRTA PHYLLA, sp. n. (Plate XIX. fig. 1.)

Male. Primaries and secondaries hyaline; the veins black. Primaries crossed beyond the middle from the costal margin to the outer margin, above the anal angle, by a wide black band; the costal margin, apex, outer and inner margins bordered with black, shot with dark blue. Secondaries bordered with black on the costal margin, apex, and outer margin; the fringes of both wings black. Underside very similar to the upperside, with the costal margin of both wings edged with white. Antennæ black; palpi black, white on the underside; front of the head white, the underside of the head bright red; thorax and tegulæ black; abdomen dark blue, with a narrow white line extending from the base to the anus; underside of the abdomen and the legs white.

Expanse $1\frac{3}{4}$ inch.

Hab. Ecuador, Santa Lucia (*Wolf, Mus. D.*).

Allied to *A. micilia*, Cram., but very distinct.

ICHORIA, Butl.

ICHORIA CHALCOMEDUSA, sp. n.

Primaries deep black, slightly shot with green at the base. Secondaries hyaline; the apex and outer margin edged with black, the fringes of both wings black. Palpi, thorax, and legs black. The head and a large spot at the base of the thorax bright metallic blue. The abdomen greenish black. Antennæ black, tipped with white.

Expanse $1\frac{4}{10}$ inch.

Hab. S. Brazil, Porto Real (*Mus. D.*).

Allied to *Ichoria tricincta*, H.-S., but very distinct.

ARGYROEIDES, Butl.

ARGYROEIDES (?) ORTONA, sp. n.

Primaries and secondaries whitish hyaline; the veins brownish black, excepting at the base of the primaries, where they are pale yellow. Primaries: the apex, outer and inner margins, bordered with brownish black, widest at the apex. Secondaries with only the marginal line black; the fringes of both wings black, the

underside of the secondaries whitish at the base. Head, antennæ, palpi, thorax, abdomen, and legs black; the underside of the abdomen white.

Expanse 1¼ inch.

Hab. Ecuador, Chiguinda (*Buckley*, *Mus. D.*).

I provisionally place this insect in the genus *Argyrocides*, Butler, from which it differs in having rather longer and wider primaries and longer secondaries; the antennæ are also slightly more deeply pectinated.

Syntrichura, Butl.

Syntrichura ceres, sp. n.

Male. Primaries hyaline white; the veins, apex, outer and inner margins black. Secondaries hyaline, the apex broadly bordered with black. The head and thorax black, front of head and the collar white. Antennæ and legs black. Abdomen above dark bluish black, with a row of white spots down the middle from the base to the anus. The underside of the thorax and abdomen greyish white.

Expanse 1¾ inch.

Hab. British Guiana, Essequibo River (*Whitely*, *Mus. D.*).

A very distinct species, not nearly allied to those already described.

Fam. Arctiidæ.

Subfam. Charideinæ.

Charidea, Dalm.

Charidea orbona, sp. n. (Plate XIX. fig. 2.)

Male. Primaries and secondaries deep black. Primaries streaked with blue on the costal margin, close to the base. A wide orange band crosses the wing beyond the middle from the costal margin to the outer margin above the anal angle. Underside very similar to the upperside, but the secondaries are shot with dark blue at the base and on the costal margin; the fringes of both wings black. Head, thorax, abdomen, antennæ, and legs black. Collar, tegulæ, and a narrow line down the middle of the abdomen bright blue.

Female identical with the male.

Expanse, ♂ ♀, 1¾ inch.

Hab. S.E. Brazil, Santa Catharina (*Mus. D.*).

A very distinct species, allied to *Charidea jynx*, Hübn., from which it is at once distinguished by entirely wanting the broad yellow band on the inner margins of the primaries.

Androcharta, Feld.

Androcharta leechi, sp. n.

Male. Primaries dark brown, with two small metallic blue spots at the base, a round spot in the cell nearest the costal margin,

a spot below the cell, and three spots beyond the end of the cell all creamy white. Secondaries creamy white, clouded with brown at the base and partly along the costal margin. The head, antennæ, palpi, thorax, abdomen, and legs dark brown; the back of the head and the collar metallic blue; the base of the tegulæ creamy white; the three basal segments of the abdomen above bright red, edged with metallic blue. Underside very similar to the upperside, but secondaries are dark brown, with only a small creamy white spot in the middle.

Expanse $1\frac{3}{4}$ inch.

Hab. Brazil, Ceará (*Leech, Mus. D.*).

I am indebted to Mr. Leech for an example of this fine species, which I have much pleasure in naming after him; it was captured by Mr. Leech at Ceará in August 1884.

Subfam. Ctenuchinæ.

Euagra, Walk.

Euagra cerymica, sp. n.

Primaries black, shot with bright blue from the base along the costal and inner margin; a hyaline spot similar to that in *Euagra angelica*, Butler, but shorter and broader, not reaching almost to the base of the wing as in that species. Secondaries hyaline; the costal margin and apex broadly black; the inner margin and anal angle bright blue. Underside as above, but with no blue on the wings. Antennæ, palpi, and legs black. Head bright red; abdomen dark blue.

Expanse $1\frac{1}{2}$ inch.

Hab. Panama (*Boucard, Mus. D.*).

This species is allied to *Euagra angelica*, Butl., from which it is at once distinguished by the bright red head and much shorter and wider hyaline spot on the secondaries.

Subfam. Pericopinæ.

Metastatia, Butl.

Metastatia pampa, sp. n.

Sexes alike. Primaries black, hyaline at the base and a wide band crossing the wing beyond the middle from the costal margin to the anal angle; the costal and inner margin dark bright blue from the base to about the middle. Secondaries hyaline; the costal apex and outer margin black; the inner margin deep blue. Underside similar to the upperside, but paler in colour and without any blue shade. Antennæ, palpi, and legs black; thorax and abdomen above dark bright blue, on the underside black; the anus yellowish white.

Expanse $1\frac{3}{10}$ inch.

Hab. Ecuador, Sarayacu (*Buckley, Mus. D.*).

A small species, allied to *Metastatia saphira*, Staudinger.

METASTATIA OSSA, sp. n.

Sexes alike. Primaries hyaline, the veins black. Costal apex, outer and inner margin, and a wide band crossing the wing about the middle black, with a rich blue gloss. Secondaries hyaline; the apex and outer margin black, glossed with dark blue. Underside as above, but without the blue gloss. Antennæ, palpi, and legs black; the head, thorax, and abdomen deep blue; the underside of the abdomen greyish white.

Expanse 1½ inch.

Hab. Colombia, interior (*Wheeler, Mus. D.*).

A very beautiful species, allied to *M. pampa*, Druce.

METASTATIA CHELIDON, sp. n. (Plate XIX. fig. 3.)

Primaries black, with a rather wide hyaline band crossing the wing beyond the middle; the costal margin, the outer edge of the white band, and the inner margin bright dark blue; the apex tipped with white. Secondaries hyaline; the costal apex, outer and inner margins bright dark blue. Underside similar to the upperside, but browner in colour and with the base of both wings shot with blue. Antennæ, palpi, and legs black; head, thorax, and abdomen dark blue; tegulæ black, edged with blue; abdomen with a white line down the middle; underside of the abdomen white, with a black line down the middle.

Expanse 1¾ inch.

Hab. Colombia, interior; Ecuador, Sarayacu (*Buckley, Mus. D.*).

A beautiful species, not closely allied to any known to me.

METASTATIA (?) PALES, sp. n. (Plate XIX. fig. 4.)

Male. Primaries black, shot with blue at the base, a short streak close to the base, a wide band crossing the wing about the middle from near the costal margin to the anal angle, which it does not quite reach, and a small, apical, oval spot all hyaline. Secondaries hyaline; the costal apex and outer margin blue-black; the veins black. Underside: both wings very similar to the upperside, but without any blue gloss. Head, antennæ, and thorax black. Abdomen dark blue; the anal segment edged with white; a white line on each side of the abdomen and one down the middle; the underside of the abdomen white, of the head and front of the thorax orange-yellow; legs black, white on the upperside.

Female very similar to the male, but has the hyaline markings on the primaries rather larger.

Expanse, ♂ ♀, 1½ inch.

Hab. Ecuador, Sarayacu (*Buckley, Mus. D.*).

A very distinct species, not closely allied to any other known to me.

EUCYANE, Hübn.

EUCYANE POLIANA, sp. n.

Female. Primaries deep black, crossed beyond the middle from

the costal margin to the anal angle by a wide white band. Secondaries brownish black, with a dark blue shade at the base; the fringes of both wings black. The head, palpi, antennæ, thorax, legs, and underside of the abdomen black; the upperside of the abdomen blue-black.

Expanse 2¼ inches.

Hab. British Guiana, Essequibo River (*Whitely*, *Mus. D.*).

Not closely allied to any species known to me.

EUCYANE ORTHOPEA, sp. n.

Primaries and secondaries deep black. Primaries crossed beyond the middle from the costal margin to the anal angle by a narrow dark chrome-yellow band, deeply dentated on the outer edge; the fringes of both wings black. Underside very similar to the upperside, but the yellow band is slightly wider. Head, antennæ, thorax, abdomen, and legs deep black; palpi above black, on the underside yellow.

Expanse 2¼ inches.

Hab. Colombia, interior (*Wheeler*, *Mus. D.*).

A very distinct species, allied to *E. chislon*, Druce.

EUCYANE PHILOMELA, sp. n.

Primaries black, shot with rich dark blue; the cell hyaline; a wide hyaline band crosses the wing beyond the middle, from the costal margin almost to the anal angle, beyond which, nearer the apex, is a small hyaline band; the inner margin, from the base almost to the anal angle, broadly streaked with bright pale blue; the fringe black. Secondaries hyaline, shot with dark blue; the veins, costal, outer and inner margins broadly bordered with black; a light blue line extends from the base along the inner margin almost to the anal angle, but does not quite reach it; the fringe white. Underside very similar to the upperside, but slightly paler in colour. Antennæ, palpi, head, tegulæ, and legs black; thorax and abdomen dark bluish black; a bright blue line extends down the middle of the abdomen from the base to the anus; the underside of the abdomen white.

Expanse 2¼ inches.

Hab. Interior of Colombia (*Mus. D.*).

A distinct and beautiful species, somewhat resembling *Phanoptis cyanomelas*, Felder, which is wrongly placed in the genus *Isostola* by Kirby in his catalogue of Lepidoptera Heterocera.

Subfam. PHŒGOPTERINÆ.

NEOZATREPHES, gen. nov.

Male. Antennæ long, finely pectinated. Palpi short, hairy, the third joint very minute; thorax and abdomen stout, legs thick. Primaries long and narrow; the costal margin slightly convex; the apex slightly rounded; the inner margin straight; the cell very short, not more than one-third the length of the wing. Secondaries

long, the cell short, the costal margin convex, the apex pointed, the anal angle rounded.

Type: *Neozatrephes telesilla.*

NEOZATREPHES TELESILLA, sp. n. (Plate XIX. fig. 5.)

Male. Primaries pale semihyaline brown, crossed from the costal to the inner margin by five indistinct bands of orange-yellow spots, the fourth and fifth very indistinct; a white line extends from the apex to the anal angle and then along the inner margin to the base of the wing; the fringe brown. Secondaries semihyaline pinkish white, darkest along the costal margin. Head and antennæ orange; thorax brown. Abdomen on the upperside red, underside yellow, with the three anal segments white; anal tuft orange; legs reddish orange.

Expanse 1¾ inch.

Hab. Ecuador, Sarayacu (*Buckley, Mus. D.*).

This species is quite distinct from any known to me; the exceedingly short cell of the primaries at once separates it from all allied forms.

EUCEREON, Hübn.

EUCEREON CHALCODON, sp. n. (Plate XIX. fig. 6.)

Primaries dark brown; the veins and several fine lines crossing the wing from the costal to the inner margin pale fawn-colour, the first line zigzag near the base, the second about the middle of the cell, the third beyond, but joining the second line below the cell and then extending to the inner margin, forming a large brown spot about the middle of the wing; a marginal row of pale ring-shaped markings extending from apex to the anal angle; the fringe brown and fawn-coloured. Underside dark brown, with a spot about the middle of the costal margin and a narrow band near the apex greyish white. Secondaries semihyaline white, with the apex, outer margin, and anal angle clouded with brown. The head, thorax, collar, tegulæ, and base of the abdomen dark brown; a large white spot on the base of the thorax; the abdomen bright red, above the underside and the anal segment brownish black; the antennæ and fore legs pale greyish fawn-colour; the hind legs dark brown.

Expanse 2 inches.

Hab. S.E. Brazil, Petropolis (*Mus. D.*).

I am indebted to the kindness of Lord Walsingham for the pleasure of describing this distinct species and for adding the specimen to my collection.

THYSANOPRYMNA, Butl.

THYSANOPRYMNA CEPIANA, sp. n.

Primaries greyish brown, crossed from the costal to the inner margin by three darker brown bands, the first near the base, the second, the widest, about the middle, the third submarginal. Secondaries hyaline, the veins and the outer margin blackish

brown. Underside similar to the upperside, but the primaries without the bands crossing the wing; the fringes of both wings black. Head, antennæ, palpi, thorax, and abdomen black; abdomen with a row of bright red spots on each side the anal tuft, and a large spot at the base of the abdomen on the underside orange; the underside of the thorax red.

Expanse 2 inches.

Hab. Venezuela, Merida (*Mus. D.*).

A fine and distinct species, allied to *Thysanoprymna pyrrhopyga*, Walker, from Brazil.

Halisidota, Hübn.

Halisidota laroipa, sp. n.

Male. Primaries pale fawn-colour, crossed from the costal to the inner margin with fine zigzag dark brown lines; two spots on the costal margin, one at the end of the cell, and two on the outer margin dark brown; the fringe alternately fawn-colour and dark brown. Secondaries pale yellowish white. Head, antennæ, thorax, abdomen, and legs yellowish fawn-colour.

Expanse 1½ inch.

Hab. Ecuador, Sarayacu (*Buckley, Mus. D.*); S.E. Brazil (*Mus. D.*).

A common species in Ecuador.

Halisidota pandama, sp. n. (Plate XIX. fig. 8.)

Female. Primaries citron-yellow, spotted with brown; at the base a band of brown spots crosses the wing at the end of the cell, from the costal to the inner margin, beyond which, near the apex, are several large elongated brown spots; the veins edged with brown on each side along the outer margin; the fringe yellow. Secondaries pale yellowish white, clouded with brown on the outer margin. The head, thorax, and tegulæ citron-yellow; the collar and tegulæ with brown spots; abdomen above dark yellow, white on the underside; antennæ brown; legs brownish white.

Expanse 2 inches.

Hab. Ecuador, Malo (*Mus. D.*).

A very distinct species, allied to *H. sesia*, Sepp.

Phœgoptera, Boisd.

Phœgoptera chimæra, sp. n.

Male. Primaries deep black. Secondaries white, broadly bordered with black from the apex to the anal angle. Antennæ, palpi, thorax, abdomen, and legs black; two spots on the back of the head, and one on each tegulæ, orange-yellow; abdomen with a row of orange-yellow spots on each side, and with the four anal segments banded with yellow.

Expanse 2¾ inches.

Hab. Paraguay (*Mus. D.*).

A fine species allied to *P. umber*, Cram., and *P. almopia*, Druce, from both of which it is at once distinguished by the white secondaries.

Fam. Melameridæ.

Flavinia, Walk.

Flavinia (?) choana, sp. n.

Primaries black, with a wide chrome-yellow band, extending from the base along the inner half of the wing, nearly to the anal angle, and a wide chrome-yellow band crosses the wing near the apex, from the costal to the outer margin; the fringe black. Secondaries black, the inner margin and an oval spot, about the middle of the outer margin, chrome-yellow; the fringe black. Underside very similar to the upperside, but with the costal margin of the secondaries bordered with chrome-yellow. Antennæ, palpi, head, thorax, and tegulæ black; tegulæ edged with chrome-yellow; abdomen above black, with a wide chrome-yellow band on each side; the underside white; legs black.

Expanse $1\frac{3}{4}$ inch.

Hab. East Peru (*Mus. D.*).

This insect is quite unlike any other species known to me.

Devara, Walk.

Devara charisia, sp. n. (Plate XIX. fig. 7.)

Male. Primaries black, with a white spot at the end of the cell, extending downwards to near the anal angle; fringe greyish black. Secondaries white, bordered with black from the apex to the anal angle; the fringe greyish. Underside: both wings very similar to the upperside, but greyer in colour. Antennæ, palpi, head, and thorax black; abdomen above black on the underside, and the legs greyish white.

Expanse $1\frac{1}{4}$ inch.

Hab. Ecuador, Sarayacu (*Buckley, Mus. D.*).

Allied to *D. subsericea*, Feld.

Devara pallor, sp. n. (Plate XIX. fig. 9.)

Male. Primaries black, the basal half and oval spot beyond hyaline white. Secondaries hyaline white, bordered with black from the apex to the anal angle; the inner margin edged with black; the fringes black. Underside like the upperside, excepting that the costal margin of the secondaries is black. Antennæ, head, thorax, and abdomen above black; the underside of the thorax yellow, of the abdomen white; the legs greyish black. Female similar to the male.

Expanse $1\frac{1}{16}$ inch.

Hab. Ecuador, Sarayacu (*Buckley, Mus. D.*).

A very distinct species, allied to *D. charisia*, Druce.

DEVARA CHEPTA, sp. n. (Plate XIX. fig. 10.)

Male. Primaries deep black, with a small white streak extending from the base, about halfway across the wing. Secondaries white, very broadly bordered with black from the apex to the anal angle; the fringes of both wings black. Head, antennæ, and palpi black; collar white; abdomen black, spotted with white on each side; legs greyish black.

Expanse 1½ inch.

Hab. Bolivia (*Mus. D.*).

Allied to *D. charisia*, Druce, and *D. subsericea*, Feld., but differs greatly from either of them.

NELO, Walk.

NELO TOXICRATA, sp. n. (Plate XIX. figs. 11, 12.)

Male. Upperside similar to *N. philodamea*, Druce, but rather brighter in colour; on the underside it differs from that species in having a large orange-yellow spot on the primaries, beyond the middle; in all other respects the two species are almost identical.

Expanse 1¾ inch.

Hab. Peru (*Mus. D.*).

Fam. DIOPTIDÆ.

LAURON, Walk.

LAURON CHOMA, sp. n.

Female. Primaries black, hyaline from the base to about the middle; the costal margin yellowish at the base; the inner margin orange-yellow from the base to the anal angle; and two spots on the outer margin orange-yellow, joining a narrow white band that crosses the wing from the costal to the outer margin. Secondaries hyaline; the veins all black; the apex bordered with black; the outer margin broadly banded with orange-yellow. The fringes of both wings greyish black; the underside similar to the upperside, but without the orange-yellow on the inner margin of the primaries. Head, palpi, and antennæ black; thorax orange-yellow; abdomen brownish black, with a bluish-white line down the middle; the underside greyish white; the legs black.

Expanse 1¾ inch.

Hab. Ecuador, Intaj (*Buckley, Mus. D.*).

A distinct species, not closely allied to any known to me.

LAURON OSIBA, sp. n. (Plate XIX. fig. 13.)

Male. Primaries black; a wide streak extending from the base to beyond the middle, whitish hyaline; the costal streaked with orange-yellow from the base nearly to the apex; part of the inner margin and the anal angle bordered with orange-yellow; a narrow white band crosses the wing near the apex, but does not touch either margin. Secondaries whitish hyaline; the apex and

outer margin bordered with black. Underside very similar to the upperside. Head, antennæ, palpi, and thorax black; abdomen greyish blue; legs black.

Expanse 2 inches.

Hab. Ecuador, Sarayacu (*Buckley, Mus. D.*).

LAURON PADUA, sp. n. (Plate XIX. fig. 16.)

Primaries brownish black, with a large central whitish hyaline space in the middle of the wing; the veins black; the costal margin and a wide submarginal band, which extends from the costal margin to the anal angle, brownish yellow. Secondaries whitish hyaline; the outer margin bordered with black, with a rather wide brownish-yellow line extending from the apex to the anal angle. Underside the same as above. Head, antennæ, palpi, thorax, and abdomen black; abdomen with two bluish-white lines extending from the base to the anus; the underside of the abdomen white, with a black line down the middle; the legs black.

Expanse 2 inches.

Hab. Ecuador, Sarayacu (*Buckley, Mus. D.*).

A beautiful species, very distinct from any other known to me; it has a great resemblance to *Ithomia corena*, Hew., from the Amazons and Ecuador.

LAURON BATESI, sp. n. (Plate XIX. fig. 15.)

Male. Primaries black, with two white spots, one at the end of the cell, and a round one below; the costal margin streaked with yellow at the base; a wide submarginal orange-yellow band crosses the wing from the costal margin to the anal angle. Secondaries whitish hyaline; the outer margin broadly banded with black, and with a narrow orange-yellow line extending from the apex to the anal angle. Underside the same as above. Head, antennæ, palpi, thorax, and underside of the abdomen white; legs black.

Expanse $1\frac{3}{4}$ inch.

Hab. Amazons, São Paulo (*Bates, Mus. D.*).

A fine species, allied to *L. padua*, Druce.

LAURON (?) CHARIATA, sp. n. (Plate XIX. fig. 14.)

Male. Primaries whitish hyaline, the costal margin, the apical portion of the wing, and the anal angle chrome-yellow; the inner margin and inner and outer margins of the chrome-yellow edged with dark brown, the veins on the hyaline part of the wing black. Secondaries hyaline white, edged with chrome-yellow from the apex to the anal angle; the costal margin dark brown; the fringes of both wings brown. Underside as above. The head, antennæ, palpi, thorax, abdomen, and legs black. Abdomen on the upperside with two white lines extending from the base to the anus; the underside white; tegulæ chrome-yellow.

Expanse $1\frac{1}{2}$ inch.

Hab. Ecuador, Sarayacu (*Buckley, Mus. D.*).

A small species, not closely allied to any other known to me.

NEOLAURONA, gen. nov.

Male. Antennæ rather long, deeply pectinated. Palpi, the third joint long. Head small; thorax and abdomen stout, the abdomen extending beyond the wings; legs long, slender; hind tibia with two pairs of small spurs. Primaries long, narrow; the costal margin straight; apex rounded. Secondaries long, rounded at the apex and anal angle.

Female. Antennæ simple.

Type: *Pericopis hazara*, Butl.

This genus is allied to *Lauron*.

NEOLAURONA OVIA, sp. n. (Plate XIX. fig. 17.)

Female. Primaries black, crossed from the costal margin by two wide cream-coloured bands; the costal and inner margin near the base, and two small spots near the anal angle, cream-colour. Secondaries cream-colour, the veins black; the costal margin, apex, and outer margin broadly bordered with black; a large cream-coloured spot close to the apex. Underside the same as the upperside, but paler in colour. Head, antennæ, palpi, thorax, and upperside of the abdomen black; underside of the abdomen cream-colour; tegulæ black, edged with cream-colour; legs black, greyish on the underside.

Male. Unknown.

Expanse, ♀, 2¼ inches.

Hab. Ecuador, Sarayacu (*Buckley*, *Mus. D.*).

A very distinct species, quite unlike any other known to me.

DIOPTIS, Hübn.

DIOPTIS CHARILA, sp. n. (Plate XX. fig. 1.)

Male. Primaries black, hyaline at the base and partly along the inner margin; a whitish hyaline band crosses the wing beyond the middle nearest the apex. Secondaries hyaline; the veins black; the costal and outer margins broadly bordered with black. Underside very similar to the upperside, but the costal margin of both wings near the base greyish white. Head, antennæ, palpi, thorax, and abdomen black; the underside of the abdomen, thorax, and legs greyish white; the collar yellow.

Expanse 1½ inch.

Hab. British Guiana, Essequibo River (*Whitely*, *Mus. D.*).

A very distinct species, allied to *D. oneja*, Bates.

DIOPTIS RORAIMA, sp. n. (Plate XX. fig. 2.)

Male. Primaries hyaline; the costal margin, apex, outer and inner margin black; the anal angle and part of the outer margin streaked with orange-yellow; a rather large whitish band close to the apex. Secondaries hyaline; the veins and outer margin black; a wide orange-yellow band edged with black on the inner side extends from the apex to the anal angle. Underside very similar to the upperside, but with the costal margin of both wings near

the base greyish white. The head, antennæ, palpi, thorax, and abdomen black; tegulæ yellow; a line on each side and one on the underside of the abdomen white; legs above black, greyish white on the underside.

Expanse $1\frac{3}{4}$ inch.

Hab. British Guiana, Roraima Mountain (*Whitely, Mus. D.*).

A pretty species, allied to *D. cyma*, Hübn., and *D. trailii*, Butl.

Dioptis pallene, sp. n. (Plate XX. fig. 3.)

Male. Primaries black, hyaline near the base; a wide semi-hyaline whitish band crosses the wing beyond the middle from the costal almost to the outer margin, and an oval whitish spot close to the anal angle. Secondaries hyaline; the veins, costal and outer margins black; a submarginal orange-yellow narrow line extends from the apex to the anal angle. Underside very similar to the upperside, but with the base of costal margin of the secondaries greyish white. Head, underside of the thorax, and abdomen white; antennæ, upperside of the thorax, and abdomen black; legs greyish white; tegulæ yellow.

Expanse $1\frac{1}{2}$ inch.

Hab. Ecuador, Sarayacu (*Buckley, Mus. D.*).

Dioptis cheledonis, sp. n. (Plate XX. fig. 5.)

Male. Primaries hyaline; the apex, outer margin, and a narrow band crossing the wing from the costal margin to the anal angle black; a wide white band crosses the wing near the apex from the costal margin nearly to the outer margin, but does not reach it; a square white spot close to the anal angle; a spot at the apex and the inner margin orange-yellow. Secondaries hyaline; the veins, costal and outer margins black; a submarginal line extending from the apex to the anal angle orange-yellow. Underside very similar to the upperside, but generally paler in colour. Head, antennæ, palpi, thorax, and abdomen above black. Underside of abdomen and legs greyish brown; tegulæ yellow.

Expanse 2 inches.

Hab. Ecuador, Intaj (*Buckley, Mus. D.*).

A beautiful species, quite unlike any other known to me.

Dioptis egla, sp. n. (Plate XX. fig. 4.)

Male. Primaries hyaline; the costal and inner margins, apex, and veins dark blackish brown, crossed beyond the middle by a broad band of orange-yellow; a brown band at the end of the cell, a small spot close to the costal margin, and an oval spot near the anal angle whitish hyaline. Secondaries hyaline; the veins and outer margin blackish brown; a submarginal line extending from the apex to the anal angle orange-yellow. The underside very similar to the upperside, but slightly paler in colour. Head, antennæ, palpi, thorax, legs, and the upperside of the abdomen black; underside of the abdomen greyish white. Female almost

identical with the male, but with the costal margin of the primaries orange-yellow to the base.

Expanse 1¾ inch.

Hab. Amazons, Tunantins (*Bates, Mus. D.*); Ecuador, Sarayacu (*Buckley, Mus. D.*).

A beautiful species, closely resembling *Ithomia egla*, Hewitson, also from Ecuador.

DIOPTIS CHARON, sp. n. (Plate XX. fig. 6.)

Primaries brownish black, hyaline from the base to the end of the cell and along the inner margin, crossed beyond the middle by a whitish semihyaline band, curved slightly inward near the anal angle. Secondaries hyaline; the veins black, the apex and outer margin bordered with black; a rather wide submarginal orange-yellow line extends from the apex to the anal angle. The head, antennæ, palpi, thorax, and abdomen on the upperside black; abdomen on the underside and legs greyish white. The underside of both wings similar to the upperside.

Expanse 1½ inch.

Hab. Bolivia (*Buckley, Mus. D.*).

A distinct species, allied to *D. ilerdina*, Bates, from which it is at once distinguished by its clear hyaline wings.

DIOPTIS OTANES, sp. n.

Male. Primaries black; two small streaks from the base hyaline; a square spot at the end of the cell, a round spot close to the anal angle, and two small spots close to the apex whitish hyaline. Secondaries hyaline; the costal and outer margins broadly bordered with black; the veins black; an oval-shaped spot at the end of the cell white. The underside the same as above. Front of head white; antennæ, head, thorax, and upperside of the abdomen black; the underside of the abdomen and legs white; the upperside of the legs black; tegulæ orange-yellow.

Expanse 1$\frac{4}{10}$ inch.

Hab. Ecuador, Rio Napo (*Whitely, Mus. D.*).

A small species, allied to *D. noctiluces*, Butler, but with the secondaries quite distinctly marked.

DIOPTIS PANDATES, sp. n.

Male. Primaries black, partly hyaline near the base; a small spot at the end of the cell, a large oval-shaped spot beyond nearest the apex, and a small elongated spot close to the anal angle white. Secondaries hyaline; the veins black; the costal margin, apex, and outer margin broadly bordered with black. The underside similar to the upperside. The head, antennæ, palpi, thorax, abdomen, and legs black; tegulæ orange-yellow.

Expanse 1¾ inch.

Hab. Colombia, interior (*Mus. D.*).

A very distinct species, allied to *D. onega*, Bates, and *D. phelina*, Felder.

DIOPTIS CHLORIS, sp. n.

Male. Primaries black, crossed beyond the middle by two small hyaline bands, neither of which reaches the margin of the wing; a small hyaline streak extends from the base as far as the end of the cell. Secondaries whitish hyaline, broadly bordered with black at the apex, outer and inner margins. Underside very similar to the upperside, but the inner margin of the secondaries broadly bordered with greyish white. Head, antennæ, thorax, abdomen, and legs black; the underside of the abdomen white.

Hab. Ecuador, Chiguinda (*Buckley, Mus. D.*).

This species is quite unlike any known to me.

MONOCREAGRA, Feld.

MONOCREAGRA ORTHYADES, sp. n. (Plate XX. fig. 7.)

Primaries and secondaries dusky hyaline; the veins of both wings black. The costal margin, apex, and outer margin of the primaries bordered with black; the secondaries the same. Underside similar to the upperside. Head, antennæ, palpi, thorax, abdomen, and legs black; the underside of the abdomen greyish brown.

Expanse $1\frac{3}{4}$ inch.

Hab. Ecuador, Intaj (*Buckley, Mus. D.*).

Allied to *M. pheloides*, Feld., from which it is at once distinguished by the entire absence of the white band on the primaries.

MONOCREAGRA (?) CHARES, sp. n. (Plate XX. fig. 8.)

Primaries and secondaries hyaline; the veins dark brown. Primaries crossed at the end of the cell by a brown band, beyond which a wide orange-yellow band crosses the wing from the costal to the outer margin, almost reaching the anal angle. Secondaries with the outer margin shaded with orange-yellow; the fringes brown. Underside very similar to the upperside. Antennæ black; the head, thorax, abdomen, and legs dark brown; the underside of the abdomen brownish white.

Expanse 2 inches.

Hab. Ecuador, Sarayacu (*Buckley, Mus. D.*).

A fine species, exceedingly distinct from any other known to me.

MONOCREAGRA (?) CHORAX, sp. n. (Plate XX. fig. 9.)

Male. Primaries and secondaries, the veins, and the apex of the primaries black; a small white band crosses the wing beyond the middle. Secondaries with the costal and outer margins bordered with black. Underside as above; the fringes of both wings black. The head, antennæ, thorax, and abdomen black; underside of the abdomen white.

Expanse $1\frac{1}{2}$ inch.

Hab. Ecuador, Sarayacu (*Buckley, Mus. D.*).

Not closely allied to any described species.

ASTYOCHIA, Druce.

ASTYOCHIA PALLENE, sp. n.

Male. Primaries and secondaries white, very slightly hyaline; the veins of both wings pale brown; the fringes white. Head, thorax, abdomen, and legs white; antennæ dark brown.

Expanse $1\frac{1}{10}$ inch.

Hab. British Guiana (*Whitely, Mus. D.*).

ASTYOCHIA PAULINA, sp. n.

Male. Primaries hyaline grey, crossed about the middle by a wide whitish hyaline band, beyond which on the costal margin close to the apex a second band partly crosses the wing. Secondaries whitish hyaline; the costal, outer and inner margins broadly bordered with pale grey. Antennæ black; head, thorax, abdomen, and legs greyish black.

Expanse $1\frac{1}{4}$ inch.

Hab. Ecuador, Intaj and Sarayacu (*Buckley, Mus. D.*).

POLYPŒTES, Druce.

POLYPŒTES COLANA, sp. n.

Male. Primaries dark brown; the veins and a large round spot at the apex yellow. Secondaries white, broadly bordered with black from the apex to the anal angle; the inner margin grey. Underside very similar to the upperside, but the base of the primaries white. The head, antennæ, thorax, abdomen, and legs black.

Expanse $1\frac{1}{10}$ inch.

Hab. East Peru (*Whitely, Mus. D.*).

Allied to *Polypœtes erymas*, Druce.

POLYPŒTES CLETOR, sp. n.

Male. Primaries and secondaries black. Primaries crossed about the middle from the costal to the inner margin by a wide white band; the veins and a small spot on the outer margin nearest the apex yellow; the fringes of both wings black. The head, antennæ, thorax, abdomen, and legs black.

Expanse $1\frac{1}{4}$ inch.

Hab. Ecuador (*Buckley, Mus. D.*).

Allied to *P. deldon*, Druce.

GONORA, Walker.

GONORA PAPHIA, sp. n. (Plate XX. fig. 14.)

Male. Primaries and secondaries blue-black, both wings with a wide submarginal whitish hyaline band, crossed by the black veins; the fringes black. Underside the same as above. The head, antennæ, palpi, thorax, abdomen, and legs black. The front of the thorax, a small spot at the base of the tegulæ, and the underside of the abdomen white.

Expanse $2\frac{1}{4}$ inches.

Hab. East Peru (*Whitely, Mus. D.*).
A very distinct species, allied to *G. heliconiata*, Walk.

Fam. LAPARIDÆ.

EUCHONTHA, Walk.

EUCHONTHA CIRIS, sp. n. (Plate XX. fig. 10.)

Male. Primaries dark brown, the basal half white, the veins dark brown, a small spot close to the apex and one near the anal angle white. Secondaries white, broadly bordered with black from the apex to the anal angle. Underside similar to the upperside; the fringes of both wings black. Antennæ black. Head, thorax, abdomen, and legs greyish white.

Expanse $1\frac{3}{10}$ inch.

Hab. Ecuador, Intaj and Sarayacu (*Buckley, Mus. D.*).
A distinct species, allied to *E. sublactigera*, Walk.

GENUSSA, Walk.

GENUSSA CLUACA, sp. n. (Plate XX. fig. 17.)

Primaries and secondaries white. Primaries crossed beyond the middle from the costal to the outer margin with a wide black band, the apex and outer margin broadly bordered with black. Secondaries: the apex and outer margin bordered with black. Antennæ black; the head, thorax, and abdomen greyish black.

Expanse $1\frac{3}{4}$ inch.

Hab. Ecuador, Sarayacu (*Buckley, Mus. D.*).
Allied to *G. altaba*, Druce, but very distinct.

ELORIA, Walk.

ELORIA CISSUSA, sp. n. (Plate XX. figs. 13 ♂, 15 ♀.)

Male. Primaries and secondaries dark brown, semihyaline near the base of both wings. Primaries crossed beyond the middle by a wide cream-coloured band, the veins crossing the band dark brown. Secondaries with a cream-coloured streak nearest the costal margin, extending from the base to the outer margin; the fringes of both wings dark brown. Underside similar to the upperside, but with the cream-coloured band much extended over the wing. Secondaries cream-coloured, with the costal and outer margins broadly bordered with dark brown. Antennæ, palpi, head, thorax, and abdomen dark brown; the collar, underside of the thorax, abdomen, and legs yellowish brown.

Female. Primaries cream-colour, the costal margin, apex, outer and inner margins broadly bordered with dark brown. Secondaries cream-colour bordered with dark brown, the fringes dark brown; in other respects similar to the male; the underside the same as the upperside.

Expanse, ♂ 2 inches, ♀ $2\frac{1}{2}$ inches.

Hab. Ecuador, Sarayacu (*Buckley, Mus. D.*).
A very distinct species, allied to *E. ombrea*, Druce.

ELORIA CLODIA, sp. n.

Male. Primaries and secondaries semihyaline black. Primaries with a large round cream-coloured spot about the middle of the wing. Secondaries with a few cream-coloured scales at the end of the cell; the fringe of both wings black. Underside similar to the upperside, but paler, and the cream-coloured marks more suffused over the wings. Antennæ and palpi black; head and collar bright yellow; thorax and abdomen black; the underside of the abdomen yellow; legs greyish black.

Female. Similar to the male.

Expanse, ♂ 1½ inch, ♀ 2$\frac{1}{16}$ inches.

Hab. Amazons, Santarem (*Leech*, *Mus. D.*).

Fam. LASIOCAMPIDÆ.

APATELODES, Pack.

APATELODES PANDARA, sp. n.

Male. Allied to *Apatelodes firmeana*, Cr., and very similar in colour, but not quite so grey. The narrow lines crossing the primaries are straight, not curved as in that species; the second and third line crossing the wing join at the anal angle and form a V-shaped mark; the lines on the underside of both wings are also straight; the reddish-brown mark on the primaries near the apex is extended further down the outer margin.

Expanse 1½ inch.

Hab. Ecuador, Sarayacu (*Buckley*, *Mus. D.*).

APATELODES CIRNA, sp. n.

Male. Primaries greyish brown, palest along the costal margin. An indistinct waved whitish line extends from the apex to the anal angle; a large dark brown spot edged with white on the inner margin, close to the base; a small black spot at the end of the cell; on the inner margin above the anal angle the wing is pale fawn-colour, crossed by a short reddish-brown band that does not reach the cell. Secondaries greyish brown, broadly bordered with darker brown; the fringes of both wings dark brown. Underside: primaries greyish fawn-colour, the apex and part of the outer margin dark brown; secondaries fawn-colour, a spot at the end of the cell and two waved lines crossing the wing from the costal to the inner margin dark brown, the second line edged with white on the outer side, the outer margin broadly bordered with dark brown. The head, antennæ, thorax, abdomen, and legs brownish fawn-colour.

Expanse 2$\frac{1}{16}$ inches.

Hab. Ecuador, Sarayacu (*Buckley*, *Mus. D.*).

A very distinct species.

TAGORA, Walk.

TAGORA CORAX, sp. n.

Female. Primaries and secondaries pale greyish fawn-colour,

palest near the base of both wings; a brown spot in the cell; both wings crossed beyond the middle from the costal to the inner margin by a dark brown line, edged on the inner side with a narrow fawn-coloured line, and with several indistinct waved brown lines; the outer portion of both wings thickly irrorated with black scales, the fringes pale brown. Underside very similar to the upperside, but without the straight lines crossing the wings, and with a white spot at the apex of the primaries. Head, antennæ, front of the thorax, and collar black; a tuft of hair at the base of the antennæ yellow; thorax and tegulæ greyish fawn-colour; abdomen yellowish fawn-colour. Legs, the coxæ and femora yellowish fawn-colour; the tibia and tarsus black.

Expanse $4\frac{1}{4}$ inches.

Hab. Mexico, Jalapa (*M. Trujillo*).

I have placed this insect in the genus *Tagora* with considerable doubt, and probably when the male is known it will require a new genus.

Fam. Limacodidæ.

Scopelodes, Westw.

Scopelodes whitelyi, sp. n.

Primaries silky fawn-colour, the outer half of the wing the palest, the costal margin brownish at the base. Secondaries pinkish fawn-colour, the fringes of both wings yellowish brown, the underside of both wings yellowish fawn-colour. Antennæ, palpi, and front of head dark brown; head, thorax, and base of the abdomen yellowish fawn-colour; the abdomen and legs fawn-colour.

Expanse $2\frac{3}{4}$ inches.

Hab. British Guiana, Essequibo River (*Whitely, Mus. D.*).

Allied to *S. sericea*, Butler, from N. India.

Fam. Zerenidæ.

Nipteria, Guen.

Nipteria chthonia, sp. n.

Male. Primaries and secondaries uniform smoky brown. Secondaries slightly paler at the base. Underside: primaries pale brown, the costal margin banded with dark brown, a dark brown streak at the end of the cell, beyond which a cream-coloured line crosses the wing from the costal to the inner margin; a submarginal waved cream-coloured line extends from the apex to the anal angle. Secondaries pale brown; the costal margin, a wide streak from the base along the inner margin, and a large spot near the anal angle dark brown; a waved creamy-white line crosses the wing beyond the middle from the costal to the inner margin; the fringes of both wings pale brown. The head, antennæ, tegulæ, thorax, abdomen, and legs dark brown.

Expanse $1\frac{1}{2}$ inch.

Hab. Ecuador, Sarayacu (*Buckley, Mus. D.*), Loja (*Coll. Dognin*).
A small species, allied to *N. discoloraria*, Herr.-Schäff.

NIPTERIA CISSOESSA, sp. n. (Plate XX. fig. 11.)

Male. Primaries and secondaries pale grey, irrorated with darker scales along the costal margin and at the apex of the primaries; the fringe of both wings alternately black and grey. Underside: primaries pale brown, darker on the costal margin near the base and near the apex, the costal margin and the apex irrorated with white scales, a dark brown streak at the end of the cell. Secondaries dark brown, irrorated with white scales; a dark brown spot at the end of the cell. Antennæ black. Head, thorax, and abdomen grey, each segment of the abdomen edged with dark brown. Legs blackish brown.

Expanse $1\frac{5}{10}$ inch.

Hab. Ecuador, Chiguinda, Sarayacu, and Intaj (*Buckley, Mus. D.*); Loja (*Coll. Dognin*).

A distinct species, not allied to any species known to me.

NIPTERIA PERILLA, sp. n.

Male. Primaries and secondaries dark silky brown. Primaries crossed from the costal to the inner margin by two darker brown lines, the veins dark brown. Secondaries crossed below the middle from the apex to the inner margin by a narrow brown line, the fringes of both wings brown. Underside similar to the upperside, but paler in colour. Antennæ black; head, thorax, abdomen, and legs brown.

Expanse $1\frac{3}{4}$ inch.

Hab. Ecuador, Intaj (*Buckley, Mus. D.*); E. Peru, Cosnipata Valley (*Whitely, Mus. D.*).

Allied to *N. impunctata*, Thierry-Mieg, from which it is at once distinguished by the dark brown hind wings.

NIPTERIA PHILOMELA, sp. n. (Plate XX. fig. 16.)

Male. Primaries white, the costal margin, the apex, outer and inner margins bordered with greyish black, very broadly at the apex; the costal margin has three white spots, the first and second nearest the base, the third beyond the middle. Secondaries white, the outer margins from the apex to the anal angle broadly bordered with greyish black, the fringe of both wings alternately white and black. Underside: primaries white, the costal margin, apex, and outer margin clouded with brown. Secondaries pale brown, the cell and a spot beyond white. Antennæ and palpi black. Head, thorax, abdomen, and legs brown, the underside of the abdomen greyish.

Expanse 2 inches.

Hab. Ecuador, Sarayacu (*Buckley, Mus. D.*), Loja (*Coll. Dognin*).

I have four males of this species, which do not show the slightest variation.

NIPTERIA CLETAGORA, sp. n.

Male. Primaries pale fawn-colour, slightly hyaline and crossed from the costal to the inner margin by three very indistinct brown lines. Secondaries creamy white, the fringe dark fawn-colour. Underside very similar to the upperside, but the lines on the primaries are more distinct. Antennæ black. Head, thorax, abdomen, and legs dark fawn-colour.

Expanse $1\frac{3}{4}$ inch.

Hab. Ecuador, Sarayacu (*Buckley, Mus. D.*), Loja (*Coll. Dognin*).

A small species allied to *N. diaphanata*, Dognin.

NIPTERIA PHOCUSA, sp. n.

Male. Primaries and secondaries whitish hyaline, the veins black. Primaries: the costal margin, apex, and outer margin black; a black line crosses the wing beyond the middle from the costal to the anal angle. Secondaries bordered with black from the apex to the anal angle and crossed beyond the middle by a narrow black line. Antennæ black. Head, thorax, abdomen, and legs greyish black; tegulæ greyish white.

Expanse $1\frac{3}{4}$ inch.

Hab. S. Brazil, Porto Real (*Mus. D.*).

This species is not closely allied to any known to me.

NIPTERIA CLEONA, sp. n.

Male. Primaries slate-colour, crossed about the middle from the costal to the inner margin by a wide white band. Secondaries white, broadly bordered from the apex to the anal angle with slate-colour, the fringe of both wings slate-colour. Underside: primaries pale brown, the white band very similar to the upperside, the outer margin from the apex to the anal angle whitish. Secondaries uniformly pale brown. Antennæ blackish brown. Head, thorax, and abdomen slate-colour; legs greyish brown.

Expanse $1\frac{1}{2}$ inch.

Hab. Ecuador, Intaj (*Buckley, Mus. D.*).

Very distinct from any species known to me.

NIPTERIA PANIA, sp. n. (Plate XX. fig. 12.)

Male. Primaries white, the costal margin and the apical half of the wing black. Secondaries white, the costal, outer and inner margins broadly bordered with black, the fringes of both wings black. Underside almost identical with the upperside, excepting that the primaries have a large white spot at the apex. Antennæ, head, thorax, abdomen, and legs black.

Expanse $1\frac{1}{2}$ inch.

Hab. Ecuador, Intaj (*Buckley, Mus. D.*).

A small species, allied to *N. cleona*, Druce.

NIPTERIA PANTHEA, sp. n.

Male. Primaries white, the apex broadly bordered with blackish

brown. Secondaries white, bordered with blackish brown, the fringes alternately white and black. Underside: primaries similar to the upperside, but with a white spot at the apex. Secondaries white, clouded with brown; the veins dark brown. Antennæ black; front of head yellow; head, thorax, and abdomen greyish black. Underside of abdomen and legs white.

Expanse $1\frac{3}{10}$ inch.

Hab. Ecuador, Sarayacu (*Buckley, Mus. D.*).

A very distinct species, allied to *N. pania*, Druce.

NIPTERIA CLYTIA, sp. n. (Plate XXI. fig. 1.)

Male. Primaries dusky hyaline; the costal margin, a wide band crossing the wing beyond the middle, the apex and inner margin all black. A wide white band crosses the wing near the apex from the costal to the outer margin above the anal angle. Secondaries dusky hyaline; the apex, outer and inner margin bordered with black; the fringes of both wings black. Underside: primaries similar to the upperside, but with the costal margin and apex reddish brown. Secondaries with the costal margin, apex, outer and inner margins broadly bordered with reddish brown; the veins all black; a reddish-brown streak extends from the base through the middle of the cell to the outer margin, and a rather wide submarginal band of white extends from near the apex almost to the anal angle, but not quite reaching it. Antennæ, palpi, head, thorax, abdomen, and legs black; front of head, collar, and a spot on each of the tegulæ white; the underside of the abdomen white, with a black line down the middle. The female very similar to the male.

Expanse, ♂ ♀, $2\frac{1}{2}$ inches.

Hab. Ecuador, Intaj (*Buckley, Mus. D.*).

A fine species, allied to *Nipteria* (*Genusa*) *albifascia*, Mssn., specimens of which are in my collection from Bolivia.

FULGURODES, Guen.

FULGURODES PANOPEA, sp. n.

Male. Primaries white, dusky brown along the costal margin, and crossed by five waved pale brown lines, the first two near the base, the third and fourth beyond the middle close together, the fifth submarginal and does not reach the apex. Secondaries white; a rather wide pale brown submarginal line extends from the apex to the anal angle, above which are two short waved brown lines, partly crossing the wing. The marginal line of both wings brown; the fringe white; underside similar to the upperside, but with all the lines very indistinct. Antennæ black, tipped with white; palpi black; head, thorax, and tegulæ greyish brown; abdomen white, each segment edged with dark brown; legs white.

Expanse $2\frac{1}{4}$ inches.

Hab. Ecuador, Intaj (*Buckley, Mus. D.*).

FULGURODES CLUACINA, sy. n.

Male. Primaries and secondaries creamy white; the veins, costal margin, apex, and outer margin brown; an indistinct waved brown line crosses the wing beyond the middle. Secondaries: a submarginal dark brown line extends from the apex to the inner margin; the outer margin clouded with brown. The marginal line of both wings dark brown; the fringes cream-colour. Underside very similar to the upperside. Antennæ and palpi dark brown. Head, collar, and tegulæ pale brown; thorax and abdomen white, each segment of the abdomen broadly edged with black; legs dark brown.

Expanse $2\frac{1}{2}$ inches.

Hab. Colombia, Frontano, Antioquia (*Salmon, Mus. D.*).

NEPHODIA, Hübn.

NEPHODIA PIERIA, sp. n.

Male. Primaries and secondaries greyish white, both wings with a greyish spot at the end of the cell, and with a submarginal brownish-grey line extending from the costal to the inner margin, the line on the secondaries being fainter than on the primaries. Underside similar to the upperside, but slightly darker and with the lines more distinct. Antennæ pale brown. Head, thorax, abdomen, and legs greyish white.

Expanse $1\frac{1}{10}$ inch.

Hab. British Guiana, Roraima Mountain (*Whitely, Mus. D.*).

A small species, quite distinct from any known to me.

NEPHODIA PERIMEDE, sp. n.

Male. Primaries and secondaries pale semihyaline brownish white, darkest along the costal margin of the primaries. Underside very similar to the upperside, but slightly darker. Antennæ dark brown; head, thorax, and abdomen pale greyish brown.

Female almost identical with the male.

Expanse, ♂ $1\frac{1}{10}$, ♀ $1\frac{1}{2}$ inch.

Hab. British Guiana, Roraima Mountain (*Whitely, Mus. D.*).

Allied to *N. pieria*, Druce.

NEPHODIA CISSA, sp. n.

Male. Primaries and secondaries whitish hyaline, with a faint brown shade; the veins near the outer margin very pale brown. Primaries crossed from the costal margin near the apex to the inner margin by a faint greyish-brown line; the marginal line and the fringe pale brown. Secondaries crossed by two greyish-brown lines, the first about the middle, the second beyond; the fringe white. Antennæ pale brown; head, thorax, and abdomen pale brown; tegulæ greyish brown; legs brown.

Expanse $1\frac{1}{10}$ inch.

Hab. Ecuador, Sarayacu (*Buckley, Mus. D.*).

NEPHODIA CLŒLIA, sp. n.

Male. Primaries and secondaries yellowish hyaline; the costal, outer and inner margins pale fawn-colour. Primaries crossed from the costal to the inner margin by two zigzag faint brown lines, the first nearest the base, the second submarginal. Secondaries with a small spot at the end of the cell, below which a zigzag line extends from the costal to the inner margin; a second submarginal line greyish brown; the fringes of both wings pale fawn-colour. Underside the same as the upperside. Antennæ pale brown; head, thorax, abdomen, and legs yellowish fawn-colour.

Expanse $1\frac{3}{10}$ inch.

Hab. Ecuador, Sarayacu, Intaj (*Buckley, Mus. D.*).

NEPHODIA PHILYRA, sp. n.

Male. Primaries and secondaries whitish hyaline; the veins and a faint waved line crossing the wings beyond the middle very pale brown; the fringes silvery white. Antennæ pale brown; head and tegulæ yellow; thorax and abdomen white.

Expanse $1\frac{3}{10}$ inch.

Hab. Ecuador, Intaj (*Buckley, Mus. D.*).

Allied to *N. cissa*, Druce.

NEPHODIA COLADA, sp. n.

Male. Primaries and secondaries smoky hyaline black, with all the veins black. Primaries crossed beyond the middle by a very indistinct narrow black line; the fringes blackish brown. Underside as above. Antennæ black; head, thorax, abdomen, and legs dark grey.

Expanse $1\frac{3}{10}$ inch.

Hab. S.E. Brazil, Rio Janeiro (*Mus. D.*)

Fam. LARENTIDÆ.

HETERUSIA, Hübn.

HETERUSIA COMATA, sp. n. (Plate XXI. fig. 2.)

Primaries and secondaries dark brown. Primaries with a yellowish-white, semihyaline, oval-shaped spot edged with yellow beyond the middle; the fringes of both wings alternately dark brown and white. Underside: primaries dark brown, thickly irrorated with yellow scales along the costal margin and at the apex; the spot is elongated to the costal margin, forming a band partly crossing the wing. Secondaries dark brown, thickly irrorated with yellow scales; a grey zigzag submarginal line extends from the costal to the inner margin above the anal angle; the fringe alternately brown and white. The head, antennæ, thorax, tegulæ, and abdomen dark brown; the segments of the abdomen banded with yellow; the underside of the abdomen

yellowish white. The legs above dark brown, on the underside yellowish white.

Expanse $1\frac{1}{2}$ inch.

Hab. Bolivia (*Buckley, Mus. D.*).

Very distinct from any species known to me.

HETERUSIA CONNA, sp. n. (Plate XXI. fig. 3.)

Male. Primaries black; the veins at the base yellow, a wide orange-yellow band crosses the wing beyond the middle from the costal margin to the anal angle, which it does not quite reach. Secondaries black, with a large central elongated white spot; the fringe of both wings black. Underside very similar to the upperside, but with more white on the secondaries. Head, antennæ, thorax, abdomen, and legs black.

Female identical with the male.

Expanse $1\frac{4}{10}$ inch.

Hab. Ecuador, Chiguinda, Intaj (*Buckley, Mus. D.*).

HETERUSIA PLACIDA, sp. n. (Plate XXI. figs. 5, 6.)

Male. Primaries and secondaries dark orange-yellow. Primaries: the base brown, and crossed from the costal to the inner margin by three waved black bands, the first two near the base, the third beyond the middle; the apex and outer margin broadly bordered with black. Secondaries: the veins, costal margin, apex, outer margin, and a submarginal line all black; the fringes of both wings yellowish brown. Underside: primaries bright yellow; the costal margin and apex reddish brown, irrorated with grey scales, three narrow bands, partly crossing the wing, and the outer margin black. Secondaries grey, thickly irrorated with small reddish-brown scales; a spot on the inner margin and the apical part of the wing dark brown. Head, antennæ, palpi, thorax, and abdomen black; the underside of the abdomen and legs greyish brown.

Expanse $1\frac{3}{10}$ inch.

Hab. Ecuador, Chiguinda (*Buckley, Mus. D.*).

On the upperside this species slightly resembles *S. stoltzmannaria*, Oberth., but on the underside it is very different.

HETERUSIA COMANA, sp. n. (Plate XXI. fig. 7.)

Male. Primaries and secondaries dark orange-brown. Primaries crossed from the costal to the inner margin by four black bands, the first and second narrow near the base, the third and fourth wide and joined together near the anal angle, forming a large U-shaped mark, from which two short bands extend to the inner margin; the outer margin from the apex to the anal angle broadly bordered with black; the fringe alternately white and black. Secondaries: the veins, a submarginal waved line, and the outer margin from the apex to the anal angle black; the fringe yellow and black. Underside: primaries bright yellow, with the black lines as above; the costal margin and the apex greyish brown. Secondaries

brownish grey, thickly irrorated with brown scales; a row of dark brown spots crosses the wing about the middle, from the costal margin to the anal angle; the apex and outer margin dark brown. The head, antennæ, thorax, and abdomen black; the legs grey, banded with brown; underside of the abdomen greyish brown.

Expanse 1 inch.

Hab. Ecuador, Chiguinda (*Buckley, Mus. D.*).

A small species, allied to *S. placida*, Druce, from which it is at once distinguished by the different shape of the bands on the primaries.

HETERUSIA PIRENE, sp. n. (Plate XXI. figs. 8, 9.)

Primaries and secondaries yellow. Primaries thickly irrorated with black scales at the base and partly along the inner margin; the outer margin broadly bordered with black from the apex to the anal angle; on the costal margin a large V-shaped black mark extends over the wing to the black outer margin. Secondaries thickly irrorated with black scales; the outer margin and the apex black; the fringe of both wings alternately black and white. Underside: primaries pale yellow, with the black markings very similar to those on the upperside, but thickly irrorated with grey scales. Secondaries cream-colour, thickly irrorated with dark brown scales; a broken brown band extends partly over the wing from the costal margin; the outer margin bordered from the apex nearly to the anal angle with reddish brown. The head, antennæ, thorax, and abdomen black.

Expanse 1¾ inch.

Hab. Ecuador, Chiguinda (*Buckley, Mus. D.*).

A beautiful species, not allied to any known to me.

HETERUSIA COMBANA, sp. n.

Male. Primaries and secondaries dark orange-yellow. Primaries: the costal margin black at the base; four black bands crossing the wing from the costal to the inner margin, the first and second narrow, close to the base of the wing, the third about the middle, the fourth beyond, bent outward in the middle; the outer margin broadly bordered with black, deeply dentated on the inner edge. Secondaries: the veins, a submarginal waved line, the apex, and outer margin black; the fringe of both wings alternately black and yellow. Underside: primaries bright yellow; the costal margin greyish brown from the base to the apex; the black lines as above, but only extending halfway across the wing. Secondaries greyish brown, thickly irrorated with dark brown scales; the apex and outer margin almost to the anal angle dark grey. The head, palpi, antennæ, thorax, and abdomen black; the underside of the abdomen and legs dark greyish brown.

Expanse 1 inch.

Hab. Ecuador, Chiguinda (*Buckley, Mus. D.*).

A small species, allied to *S. comana*, Druce.

HETERUSIA PLACILLA, sp. n. (Plate XXI. figs. 10, 11.)

Male. Primaries dark orange-red; the base, inner margin, a band crossing the wing beyond the middle, and the outer margin from the apex to the anal angle black. Secondaries black, with a wide submarginal orange-red band extending from the costal margin near the apex to the anal angle; the fringe of both wings orange-red. Underside: primaries very similar to the upperside, but considerably paler in colour, and with the costal margin and the apex shaded with reddish brown. Secondaries pale yellow, crossed from the costal to the inner margin by two bands of reddish brown; the outer margin reddish brown; a row of metallic silver spots extends round the outer margin from the apex to the anal angle; two metallic silver straight lines extend from the base to the outer margin, the first along the inner margin, the second right across the middle of the wing. The head, palpi, thorax, and abdomen black, the anal tuft and underside of the abdomen orange-red; legs reddish brown. Antennæ on the upperside alternately black and white, on the underside black.

Expanse $\frac{3}{4}$ inch.

Hab. Ecuador, Chiguinda (*Buckley, Mus. D.*).

A beautiful little species, allied to *S. chrysopterata*, Snellen, from Colombia.

HETERUSIA PINARA, sp. n. (Plate XXI. figs. 12, 13 ♂, 14 ♀.)

Male. Primaries red; the base, inner margin, a line crossing the wing beyond the middle from the costal to the inner margin all black; the outer margin broadly bordered with black from the apex to the anal angle. Secondaries red; the base, inner and outer margin black; the fringe of both wings reddish. Underside: primaries very similar to the upperside, but paler in colour; the apex brown. Secondaries brown, crossed about the middle by two reddish-brown bands. Head, antennæ, thorax, and abdomen black; underside of abdomen and anus reddish brown; legs brown.

Female. Very similar to the male, but without the black band crossing the primaries; it is also paler on the underside.

Expanse, ♂ ♀, 1 inch.

Hab. Ecuador, Chiguinda (*Buckley, Mus. D.*).

Allied to *S. placilla*, Druce, but very distinct on the underside.

HETERUSIA CONON, sp. n. (Plate XXI. fig. 4.)

Primaries and secondaries black, slightly greyish at the base of both wings. Primaries crossed from the costal margin almost to the anal angle by a wide white band; the fringe of both wings black. Underside very similar to the upperside, but very much greyer in colour. Head, antennæ, thorax, and abdomen black; legs and the underside of the abdomen dark grey.

Expanse $1\frac{1}{10}$ inch.

Hab. Ecuador, Sarayacu (*Buckley, Mus. D.*).

A small species, allied to *S. dispilata*, Snellen.

Fam. Erateinidæ.

Eratina, Doubl.

Eratina pisca, sp. n.

Male. Primaries black, partly crossed about the middle by a wide white band, extending from the end of the cell almost to the anal angle; two small white streaks on the costal margin. Secondaries white; the base, inner margin, and anal angle dark grey; the apex bordered with black; the fringes black and white. Underside: primaries similar to the upperside, but all the black replaced by greenish yellow. Secondaries white, very thickly irrorated with greenish yellow. Scales, head, antennæ, thorax, and abdomen black; underside of the abdomen and legs greenish yellow.

Expanse 1¼ inch.

Hab. Ecuador, Chiguinda (*Buckley, Mus. D.*).

Not like any species known to me, but nearest *E. masura*, Druce.

Eratina cornelia, sp. n.

Female. Primaries black; the base and inner margin and a round spot beyond the middle white. Secondaries white, broadly bordered with black from the apex to the inner margin; the fringe of both wings black and white. Underside: primaries, the basal half of the wing white, the apical half reddish brown, the white spot as above almost joined from the costal margin by a large V-shaped white band; a submarginal fine yellow line extends from the costal margin near the apex to the anal angle. Secondaries white, broadly bordered with reddish brown; a spot on the middle of the costal margin and two on the inner margin reddish brown; a submarginal fine yellow line extends from the apex to the anal angle. Head, antennæ, thorax, and abdomen black; palpi white, with the third joint black; legs greyish brown.

Expanse 1¼ inch.

Hab. Bolivia (*Buckley, Mus. D.*).

A very distinct species, allied to *E. tryphosa*, Druce.

Trochiodes, Guen.

Trochiodes ceresia, sp. n.

Male. Primaries black, with a large, semihyaline, white, elongated spot beyond the middle. Secondaries hyaline white; the base, apex, outer and inner margins broadly bordered with black. Underside similar to the upperside. The head, antennæ, thorax, abdomen, and legs black.

Expanse 1½ inch.

Hab. Colombia, Antioquia (*Salmon, Mus. D.*).

Trochiodes plagia, sp. n. (Plate XXI. fig. 15.)

Male. Primaries black, thickly irrorated with white scales near the base; a wide white band crosses the wing beyond the middle, extending from the costal margin almost to the anal angle. Secondaries white; the base and inner margin grey; the apex and

outer margin bordered with black ; the fringe of both wings black. Underside very similar to the upperside, but with the base of the primaries white. The head, antennæ, palpi, thorax, and legs greyish black; underside of the abdomen white.

Female almost identical with the male.

Expanse, ♂ ♀, 1¼ inch.

Hab. Ecuador, Intaj, Chiguinda (*Buckley, Mus. D.*).

Trochiodes creusa, sp. n. (Plate XXI. figs. 16, 17.)

Male. Primaries and secondaries black: a faint greyish band extends from the base to the end of the cell, and a narrow yellowish-white line partly crosses the wing near the apex. Secondaries slightly greyish near the base; the fringe of both wings black. Underside: primaries very similar to the upperside, but with the markings much more distinct. Secondaries white, broadly bordered with black. Head, antennæ, palpi, thorax, abdomen, and legs black; the collar orange.

Expanse 1¼ inch.

Hab. Colombia, Antioquia (*Salmon, Mus. D.*).

Trochiodes polymela, sp. n. (Plate XXI. fig. 18.)

Primaries blackish brown, paler at the base; a wide white band crosses the wing beyond the middle from the costal margin almost to the anal angle. Secondaries blackish brown, crossed from the apex to the inner margin by a wide white band. Underside similar to the upperside, but much whiter; the fringe of both wings black. Head, antennæ, thorax, and abdomen black.

Expanse 1½ inch.

Hab. Ecuador, Sarayacu (*Buckley, Mus. D.*).

Allied to *T. plagia*, Druce, but quite distinct.

Trochiodes cormasa, sp. n. (Plate XXI. figs. 19, 20.)

Female. Primaries black, with a large oval-shaped creamy white mark on the inner margin, extending from the base almost to the anal angle. Secondaries creamy white, bordered with black from the apex to the anal angle; the fringe of both wings alternately white and black. Underside: primaries rich purplish brown, streaked with yellow at the base; a rather wide, short, white band partly crosses the wing from about the middle of the costal margin; a submarginal waved yellow line extends from near the apex to the anal angle. Secondaries creamy white, the apex and outer margin bordered with purplish brown; two small yellow spots close to the apex. Head, antennæ, palpi, and thorax black; collar and tegulæ white; abdomen and legs creamy white.

Expanse 1$\frac{3}{10}$ inch.

Hab. Ecuador, Chiguinda (*Buckley, Mus. D.*).

A beautiful species, very distinct from any other known to me.

Trochiodes coniades, sp. n. (Plate XXI. fig. 21.)

Male. Primaries brownish black, white from the base to beyond the middle of the inner margin; the fringe black. Secondaries

white, with the apex broadly bordered with black. Underside identical with the upperside. Head, antennæ, palpi, and thorax black; tegulæ and abdomen white; legs black.

Expanse 1¼ inch.

Hab. Ecuador, Sarayacu (*Buckley*, *Mus. D.*).

A small species, allied to *T. cormasa*, Druce, which it closely resembles on the upperside, but on the underside it is very different.

TROCHIODES (?) CORAS, sp. n.

Male. Primaries brownish black; a rather wide white streak extends from the base to the middle of the wing, beyond which and nearer the apex is a round white spot. Secondaries semihyaline white, bordered with brownish black from the apex to the anal angle; the inner margin greyish; the fringe of both wings black. Underside almost exactly like the upperside. Head, antennæ, thorax, and abdomen black.

Expanse 1 inch.

Hab. Ecuador, Sarayacu (*Buckley*, *Mus. D.*).

TROCHIODES (?) PLATÆA, sp. n. (Plate XXI. fig. 22.)

Male. Primaries black, an angular-shaped large white spot on the inner margin near the base, an orange-yellow spot on the outer margin below the apex. Secondaries white, broadly bordered with black; the fringe of both wings black. Underside very similar to the upperside, the orange-yellow spot on the outer margin larger. Antennæ, head, thorax, abdomen, and legs black; the underside of the abdomen white.

Female the same as the male.

Expanse 1 inch.

Hab. Ecuador, Chiguinda (*Buckley*, *Mus. D.*).

EXPLANATION OF THE PLATES.

PLATE XIX.

Fig. 1. *Agyrta phylla*, p. 282.
2. *Charidea orbona*, p. 283.
3. *Metastatia chelidon*, p. 285.
4. —— (?) *pales*, p. 285.
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PLATE XXI.

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15. *Trochiodes plagia*, p. 308.
16, 17. —— *creusa*, p. 309.
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21. —— *coniades*, p. 309.
22. —— (?) *platæa*, p. 310.

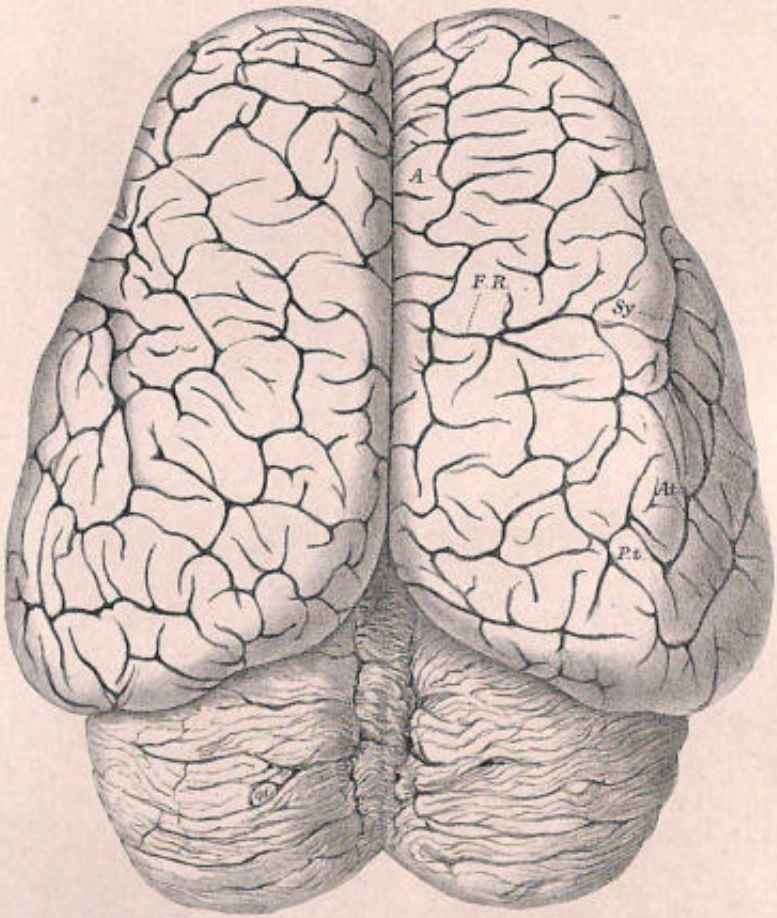
2. On the Brain of the African Elephant. By FRANK E. BEDDARD, M.A., F.R.S., Prosector to the Society.

[Received February 28, 1893.]

(Plates XXII. & XXIII.)

So far as I am aware the only existing figures and description of the brain of this animal are to be found in a paper upon the Carnivorous brain by Dr. Krueg[1]. Sir W. Turner, in his account of the Mammalian brain in general, refers[2] only to this source of information. Indeed, the opportunities of dissecting the African Elephant at all have been very few. Mr. W. A. Forbes, in 1879[3], could enumerate only five observers who had published accounts of the viscera of that animal. I am glad, therefore, to be able to offer to the Society a contribution towards a more complete knowledge of the anatomy of *Elephas africanus* in the description of its brain which I proceed to give. The brain which I propose to describe is that of a young male which died in the Society's Gardens on January 15th of the present year. The size of the brain unfortunately prevented its being kept entire for the purposes of a museum specimen; it was soon found necessary to cut the brain into four pieces; the hemispheres were separated by a longitudinal cut, and the cerebellum was also divided longitudinally into two halves. When this was done the interior of the brain was found to be in a rather inferior state of preservation. Later on it became harder. As, however, the superficial part of the brain has kept well, I am able to deal satisfactorily enough with the convolutions of the hemispheres and with the cerebellum; that is, of course, with regard to the distribution and development of the furrows. Krueg's figures[4] of the brain are merely meant to illustrate those fissures which bear an importance, according to his views, through the entire series, the remaining fissures being indicated by dotted lines. Three views are given by Krueg of the brains of both Asiatic

[1] "Ueber die Furchen auf der Grosshirnrinde der zonoplacentalen Säugethiere," Zeitschr. wiss. Zool. xxxiii. p. 652.
[2] "The Convolutions of the Brain; a Study in Comparative Anatomy," Journ. Anat. & Phys. xxv. p. 105.
[3] "On the Anatomy of the African Elephant (*Elephas africanus*, Blum.)," P. Z. S. 1879, p. 420.
[4] On pl. xxxviii. of his memoir.



J. Smit del. et lith.

Mintern Bros. imp.

BRAIN OF AFRICAN ELEPHANT.

and African Elephants. The internal lateral, superficial, and external lateral aspects are figured.

I shall now proceed to describe the brain examined by myself.

Description of the Brain.

The outlines of the hemispheres (Plate XXII.) are not by any means exactly as have been depicted by Krueg; the comparatively narrow anterior half is, in my specimen, barely so long as the broader posterior section; the lengths in my specimen were (rather roughly) $4\frac{1}{2}$ and 3 inches respectively. It seems likely, therefore, that the general form of the hemispheres in this Elephant may now be fixed with something like certainty, and that the differences between the outlines of the brain in the Indian and African Elephants as portrayed in Krueg's sketches are not real differences, so far at any rate as concerns the proportions referred to above. I did not find that the rhinal fissure had so long a visible course upon the lateral aspect of the brain as it is depicted by Krueg; this gives to the brain an altogether peculiar appearance in these drawings, which do not seem to be a correct expression of the facts as seen in the brain examined by myself. In my specimen the temporal lobe was directed much more forwards (see Plate XXIII.) so as to largely cover the rhinencephalon and conceal a considerable extent of the rhinal fissure.

The two hemispheres are unsymmetrical as regards their convolutions, as is usually the case in complexly folded brains; accordingly I describe each separately.

Right Hemisphere.

The large *temporal lobe* is directed forwards and is separated from the parietal lobe by the long and deep *Sylvian fissure* (Plate XXIII. fig. 1, *Sy*), which measures from end to end about 4 inches. From the upper extremity of the Sylvian fissure two or three small fissures radiate outwards, joining the inner of the longitudinal fissures which traverse the temporal lobe. Just before the extremity of the Sylvian fissure an evidently important (because deep), though short, fissure runs upwards at right angles, or nearly so, to the Sylvian fissure; this fissure just stops short of joining the conspicuous fissure of Rolando. It is, perhaps, to be compared to *the ascending limb of the Sylvian fissure* in other Mammalia. Anteriorly to this there is a deep fissure which I regard as being possibly comparable to the *fissure of Rolando* (Plate XXIII. fig. 1, *F.R*). It reaches the Sylvian fissure below, and runs obliquely upwards, reaching to within about $\frac{3}{4}$ of an inch of the median interhemispheral sulcus. When the brain is viewed from above this fissure of Rolando, if I am right in so identifying it, is seen to divide the hemisphere into approximately two halves. The importance of this furrow was unluckily illustrated by the hemisphere breaking into two halves at this point, a result largely due of course to its great depth and extent. Still in front of this is another important fissure which divides also into two branches, in the fashion of the letter Y, and in front of this again a second also

Y-shaped fissure running at right angles to the longitudinal axis of the brain; one of these, but I am not sure which, is probably the *pre-Sylvian fissure* (Plate XXIII. fig. 1, *P.s*).

The front aspect of the brain is marked by two principal fissures, of which the innermost (that nearest the interhemispheral sulcus) appears to me to be the anterior termination of a more or less strongly marked furrow running on the dorsal aspect of the hemisphere for more than the anterior half at a distance of rather less than an inch from the interhemispheral sulcus. The second of the two fissures observable on the frontal lobe of the brain is almost as far from the last mentioned as from the Y-shaped fissure referred to above. This fissure seems also to be the anterior end of another longitudinal furrow, which curves round posteriorly and is continuous with the first of the two fissures dividing the temporal lobe of the brain longitudinally.

The temporal lobe is divided by two furrows, of which the anterior is approximately equidistant from the anterior margin of the temporal lobe and from the posterior furrow, into three gyri—an antero-temporal, a medio-temporal, and a postero-temporal. The *posterior temporal fissure* (Plate XXIII. fig. 1, *P.t*) curves over the hemisphere and divides off an occipital lobe, becoming continuous with the sulci of the inner face of the hemisphere. The *anterior temporal furrow* bends round and forms the posterior of the three branches of the Sylvian.

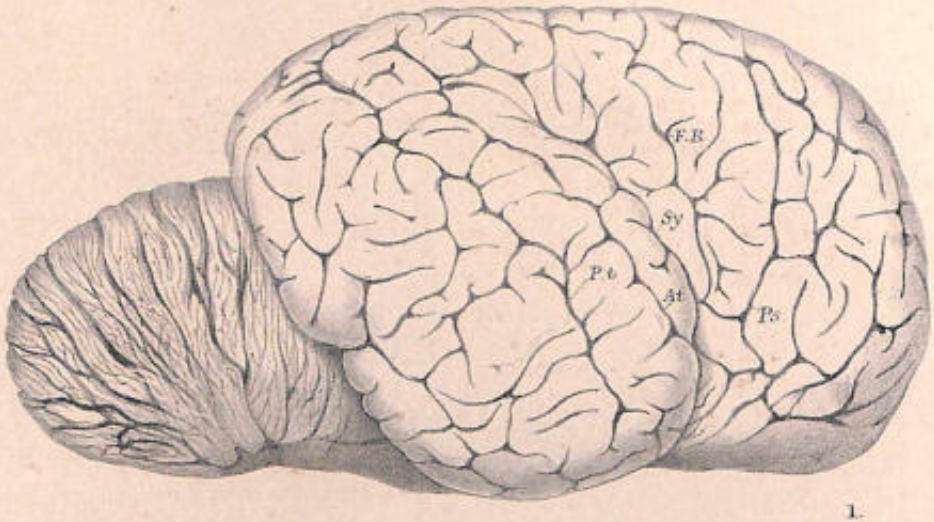
Left Hemisphere.

The left hemisphere of the brain (Plate XXIII. fig. 2) shows many detailed differences from the right; in more complicated brains there is of course usually such an asymmetry; the existence of this asymmetry, however, perhaps enables one to abstract from a consideration of both halves of the brain a list of the more important furrows.

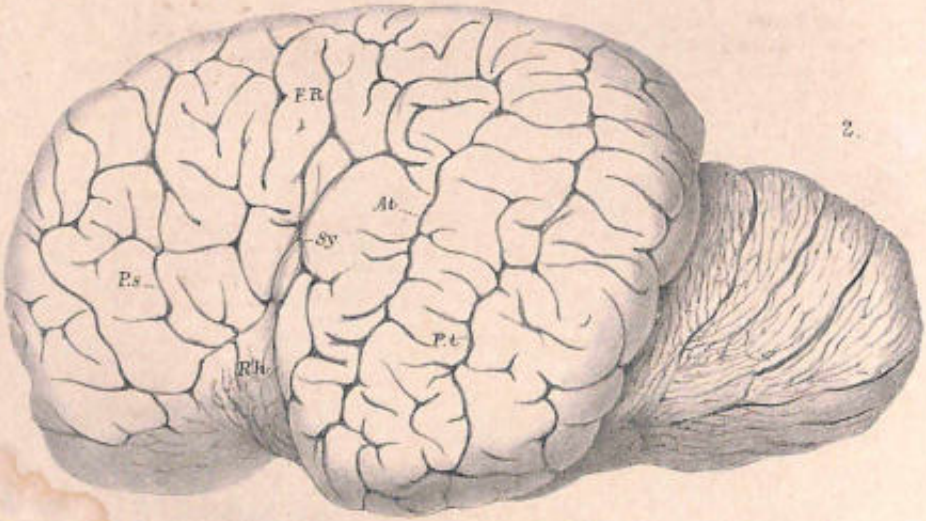
On the upper surface of the hemispheres the two longitudinal furrows are not recognizable anteriorly; they are lost by the more marked cross furrowing. Posteriorly, however, the outer of the two is very deep, and, therefore, conspicuous; it is continuous, as on the right side, with the middle temporal fissure. Both the *temporal sulci* are as pronounced on the left side as on the right. The *fissure of Rolando*, however, if I am right in so identifying it, is by no means so extensive on the left side. It seems to be divided into two tracts, of which that continuous with the *Sylvian* is the deepest; the upper half comes to within about the same distance of the internal margin of the hemisphere. Anteriorly there are the same two Y-shaped fissures, of which the first (counting from behind forwards) is, as on the right hemisphere, the deeper. The temporal fissures are as on the right side.

Cerebellum.

The cerebellum is neither figured nor described by Krueg. As shown in the accompanying drawing (Plate XXII.), it has a narrow median lobe, which is visible in the cerebellum only as seen from



1.



2.

J. Smit del. et lith.

Mintern Bros. imp.

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The left hemisphere of the brain (Plate XXIII. fig. 2) shows many detailed differences from the right; in more complicated brains there is of course usually such an asymmetry; the existence of this asymmetry, however, perhaps enables one to abstract from a consideration of both halves of the brain a list of the more important furrows.

On the upper surface of the hemispheres the two longitudinal furrows are not recognizable anteriorly; they are lost by the more marked cross furrowing. Posteriorly, however, the outer of the two is very deep, and, therefore, conspicuous; it is continuous, as on the right side, with the middle temporal fissure. Both the *temporal sulci* are as pronounced on the left side as on the right. The *fissure of Rolando*, however, if I am right in so identifying it, is by no means so extensive on the left side. It seems to be divided into two tracts, of which that continuous with the *Sylvian* is the deepest; the upper half comes to within about the same distance of the internal margin of the hemisphere. Anteriorly there are the same two Y-shaped fissures, of which the first (counting from behind forwards) is, as on the right hemisphere, the deeper. The temporal fissures are as on the right side.

Cerebellum.

The cerebellum is neither figured nor described by Krueg. As shown in the accompanying drawing (Plate XXII.), it has a narrow median lobe, which is visible in the cerebellum only as seen from

above; when viewed from behind the median lobe is concealed by the lateral lobes, which completely cover it over. Each of the lateral lobes is divided by a number of deep cross-running furrows. These are placed at irregular intervals, though parallel in direction; the cerebellum is thus divided up into a series of flat plates of varying thicknesses. Some of these fissures, which are all very deep, are not continuous right round the cerebellum; the majority of them, however, are. The two halves of the cerebellum are not symmetrical as regards the furrows.

The plate-like discs, in which the lateral lobes are cleft, are about 18–20 in number. The *small median lobe of the cerebellum is in marked contrast to what is to be met with in*, at any rate, many *Ungulates and Carnivora*.

Remarks upon the principal Sulci.

The preceding is, I believe, so far as it goes, an accurate description of the principal furrows. It now remains for me to attempt to determine which are the most important of these.

Krueg indicates five furrows of first-rate importance in the brains of both African and Indian Elephants:—

(1) *Sylvian fissure*, divided below into *processus anterior* and *processus posterior*, which join above to form *processus acuminis*.
(2) *Pre-Sylvian fissure*.
(3) *Posterior supra-Sylvian fissure*.
(4) *Sutural fissure*.
(5) *Coronal fissure*.

The diagrams do not seem to me to bring out close resemblances between the Elephantidæ and the other mammals (*Carnivora*, *Hyrax*) with which they are compared. Dr. Krueg, however, considers that there are no characters peculiar to the Proboscidian brain, but that they approach the *Carnivora* more nearly than they do the *Ungulata*.

In the brains of the *Carnivora* the furrows on the surface of the brain have an arcuate arrangement round the Sylvian fissure. In the *Ungulata*, as in the Rodents, the longitudinal fissures seem to be straighter and not to present, at any rate in so marked a degree, an arch-like course.

I admit, however, that the great development of the temporal lobe in the Elephant is a point of resemblance to the *Carnivora* (also of course to the *Primates*, which rather takes away from its significance), and that the furrows of the African Elephant's brain, as I read them, are more decidedly arcuate than they are represented to be by Krueg. But it is so extremely difficult to compare the furrows of a complexly convolute brain with those of a smoother brain that I refrain from venturing upon a definite opinion as to the affinities indicated by the study of the Elephant's brain.

I can identify all the fissures drawn by Krueg, with the exception of the anterior (or posterior, as the case may be) branch of the Sylvian. I could not see quite so marked a superficial boundary

of the Island of Reil. The direction, too, of the fissure was certainly not so vertical in the brain examined by myself.

My own observations tend to show that the two species of Elephant do not diverge so greatly in the course of this fissure as might be inferred from the diagrams of Krueg.

The lateral fissure is represented as not joining the coronal fissure in the African Elephant; but the two appear to be continuous in the Indian Elephant. This difference is evidently not one of importance, since, as I have pointed out above, the lateral fissure is quite different on the two sides of the brain.

I ought to remark, perhaps, as it may give a little more value to the statements made in the present paper, that I purposely abstained from consulting Krueg until I had drawn up a description of the brain from my own study. Hence I have not, I believe, been prejudiced in favour of any particular furrows.

In a complex brain like that of the Elephant it is a very difficult matter to settle the order of importance of the furrows. The plan I have adopted is to lay most weight upon such furrows as are common to both sides of the brain; their depth I regard as the next most important character of those open to me to select from.

I believe, therefore, after taking these points into consideration, that in addition to the "Hauptfurchen" allowed by Krueg, we must add (1) the representative (?) of a fissure of Rolando, (2) a fissure, which I have called post-temporal, lying behind the supra-Sylvian and curving forwards to run for a considerable distance along the upper surface of the brain.

The plates contain faithful copies of the actual convolutions, made by Mr. P. Smit.

EXPLANATION OF THE PLATES.

PLATE XXII.

A superficial view of the brain of the African Elephant.

PLATE XXIII.

Fig. 1. Lateral view of the brain of the African Elephant; right side. This figure is rather more tilted than the next, so that the actual dorsal surface of the brain is not visible.

2. Ditto, left side.

Sy, Sylvian fissure; *P.s*, pre-Sylvian fissure; *F.R*, fissure of Rolando; *A*, longitudinal fissure or dorsal aspect of brain; *A.t*, anterior temporal fissure; *P.t*, posterior temporal fissure; *Rh*, rhinal fissure.

3. On the Scientific Name of a Himalayan Cuckoo.

By W. T. BLANFORD, F.R.S.

[Received March 28, 1893.]

Four species of true Cuckoo, belonging to the genus *Cuculus*, are found in the Himalayas and in some other parts of India. In Jerdon's 'Birds of India' these four species were described under the names of *C. canorus*, *C. himalayanus*, *C. poliocephalus*, and

C. micropterus. Of the two other Indian species of *Cuculus* admitted by Jerdon, one called by him *C. striatus*, Drapiez (*C. affinis*, Hay), is now generally admitted not to be distinct from *C. micropterus*, whilst the other, *C. sonnerati*, is, I think, rightly placed in a separate genus, *Penthoceryx*, by Cabanis.

About the specific names of three of the four Cuckoos above enumerated, *C. canorus*, *C. poliocephalus*, and *C. micropterus*, there has never been any question. But the species described by Jerdon as the Himalayan Cuckoo, or *Cuculus himalayanus*, has been singularly unfortunate in this respect; it has received several specific names of its own, and yet has always, despite various changes of nomenclature, appeared in systematic works under a title that, so far as I can ascertain, does not belong to it. Blyth, who had in 1846 (J. A. S. B. xv. p. 18) rightly distinguished this species as *C. saturatus*, Hodgson, and regarded *C. himalayanus*, Vigors, as a synonym of *C. poliocephalus*, in his Catalogue of the Birds in the Museum of the Asiatic Society, published in 1849, entered the name of the Himalayan Cuckoo (to prevent confusion I employ Jerdon's English name) thus: "*C. himalayanus*, Vigors, (nec apud Gould, Century, pl. 54);" and kept only "*C. himalayanus*, apud Gould, *Cent.*," as a synonym of *C. poliocephalus*, evidently supposing that the bird described by Vigors, P. Z. S. 1831, p. 172, belonged to a different species from that figured in Gould's 'Century of Birds from the Himalaya Mountains' (1832). But Mr. Vigors, at the commencement of his descriptions of new species, including *C. himalayanus*, expressly stated (*l. c.* p. 170) that all the birds described by him belonged to "the sixth and last portion of the species comprising the 'Century of Birds from the Himalaya Mountains' drawn and lithographed by Mr. and Mrs. Gould," so that it appears certain that the actual specimen figured in the 'Century' as *C. himalayanus* was also described by Vigors under that name. In all probability Blyth, who always wrote under great disadvantages from want of access to books, had not Vigors's paper to refer to, and depended on a copy of the description. Horsfield and Moore, in their 'Catalogue of the Birds in the Museum of the East India Company,' and Jerdon in the 'Birds of India,' copied Blyth's mistake.

In 'The Ibis' for 1866, p. 359, in his commentary on Jerdon's 'Birds of India,' Blyth, following Schlegel (Mus. Pays-Bas, *Cuculi*, p. 7) adopted the name *Cuculus striatus* for the Himalayan Cuckoo, though he expressed his doubts in a footnote whether Drapiez's description (Dict. Class. d'Hist. Nat. iv. p. 570) did not agree better with *C. micropterus*. However, from 1866 the name *C. striatus* was generally used for the bird by Indian ornithologists until recently, although Jerdon (Ibis, 1872, p. 12) did not accept the term.

The various plumages of the three closely allied Cuckoos, *C. canorus*, the Himalayan Cuckoo (under the name of *C. striatus*), and *C. poliocephalus*, were first, I think, clearly discriminated by

Mr. Oates (Ibis, 1889, p. 355), who carefully guarded himself by saying that the names used were provisional, as he had not gone into the question of nomenclature. But in 1890 Mr. Seebohm, in his 'Birds of the Japanese Empire,' p. 170, showed that neither the name *C. himalayanus* nor that of *C. striatus* could apply to the Himalayan Cuckoo—the first clearly belonging to the rufous state of *C. poliocephalus*, whilst the latter, founded on a Javan specimen 12 French inches (13 English) long, must be referred to *C. canorus*. I quite agree in both these determinations, and I should attach as much weight to the coloration of *C. striatus* as to its length, for it is described as having the "parties supérieures d'un brun cendré, bleuâtre," which might apply to *C. canorus*, but not to the adult Himalayan Cuckoo, in which the upper parts are not brown at all, but very dark ashy grey. That *C. striatus* cannot have been *C. micropterus*, as was formerly supposed, is, I think, certain, for there is no mention in Drapiez's description of the dark subterminal tail-band characteristic of the latter species, and the upper parts of *C. micropterus* could never be termed 'bleuâtre.'

Mr. Seebohm, after having disposed of the names by which the Himalayan Cuckoo had hitherto been known, selected for it an old term of Vahl's, *C. intermedius*, which, if it belonged to the bird, would certainly be peculiarly appropriate, for the species is intermediate in size between its two near allies, *C. canorus* and *C. poliocephalus*. The name *C. intermedius* was adopted by Captain Shelley in the British Museum Catalogue of Birds (vol. xix. p. 252), though both *Cuculus striatus*, Drapiez, and *C. himalayanus*, Vigors, are quoted as synonyms, in opposition to Mr. Seebohm's opinion.

I very much fear, however, that the name *Cuculus intermedius* cannot possibly apply to the middle-sized Himalayan Cuckoo, for the following reasons. The original description of *C. intermedius* by Vahl (Skriv. af Nat. Selskabet, Kjöbenhavn, vol. iv. p. 58, 1789) ran thus:—"*Intermedius* Cuculus *cauda rotundata nigricante albo-maculata, pectore cinereo ferrugineo-tincto, humeris immaculatis, remigibus fuscis*. Hab. Tranquebariæ;" and the species is said to be distinguished from *C. passerinus* by being "*dimidio major*," and from *C. canorus* by being "*duplo minor, pennis pectoralibus apice ferrugineis, remigibus in colorem fuscum magis vergentibus, humeris immaculatis, non albis nigro punctatis.*" Now the middle-sized Himalayan Cuckoo cannot be said to be half the size of *C. canorus*, and only half as large again as *C. passerinus*, whilst *C. poliocephalus* exactly fits the description, and the last-named species occurs in Southern India, whilst to the best of my belief the Himalayan Cuckoo does not. No notice of its occurrence in the Indian Peninsula is to be found in Jerdon, nor has it, so far as I can ascertain, been procured by any subsequent collector; certainly there is no specimen from any place west of the Bay of Bengal and south of lat. 26° N. in the Hume Collection. Nor has it ever been obtained in Ceylon, as it

in all probability would have been had its range extended to Travancore. There is, however, one mention of its occurrence in the Wynaad by an excellent and trustworthy observer, the late Mr. W. Davison ('Stray Feathers,' x. p. 359); but I think this supposed occurrence may be thus explained. Mr. Davison's note is as follows:—"Sparingly distributed in the Wynaad. I should think that it was a permanent resident, as I have heard it calling late in May." I infer from this and from the fact that there is no Wynaad skin in the Hume Collection that Mr. Davison, who was collecting for Mr. Hume, did not obtain a specimen, but only heard the call. But a reference to 'Stray Feathers,' xi. p. 70, shows that Mr. Hume's (and consequently, it is reasonable to conclude, Mr. Davison's) belief was that the call of the Himalayan Cuckoo was something like "Kyphūl-pakkha"[1], and the name *Kyphūl-pakkha* is applied by some of the Himalayan people to a Cuckoo. According to Hutton, however (Blyth, Cat. B. Mus. As. Soc. p. 71, who is confirmed by Bingham and Marshall, Ibis, 1884, p. 411), this note is produced by *C. micropterus*, which doubtless occurs in the Wynaad, and it would be very difficult to tell the Himalayan Cuckoo from *C. micropterus* without shooting the bird. Jerdon (B. I. i. p. 323; Ibis, 1872, p. 12) has clearly shown that the call of the Himalayan Cuckoo is quite different, and his account is confirmed by that excellent observer Col. C. H. T. Marshall.

I came to the above conclusions more than a year ago, but before publishing them I thought it best to enquire into this question thoroughly. I therefore wrote to Mr. Davison, then living at Singapore, and asked him whether he could remember if he had ever shot the Himalayan Cuckoo in Southern India or whether he had only heard the note. He replied to me in a letter, which is, I regret to say, the last I can ever receive from one of the very best field-naturalists who have helped in working out the ornithology of India, and said that he did not procure a specimen of this Cuckoo when he was collecting for Mr. Hume, but he thought he obtained one later in a collection he made for the Madras Museum. I therefore wrote to Dr. Warth, who was in charge of that Museum, and asked him to ascertain for me whether the Museum possessed any skin of the Himalayan Cuckoo. Dr. Warth very kindly took particular pains to ascertain the facts, and he wrote that not only was there no specimen of the species in the Museum, but that, to the best of his knowledge and belief, no specimen had ever been obtained in Southern India. This was confirmed by Mr. Daly, who has an extensive knowledge of South Indian birds. I think, after this evidence, it is impossible to come to any other conclusion than that the Himalayan Cuckoo does not occur in Southern India, and that Vahl's *C. intermedius* must have been *C. poliocephalus*.

As none of the names hitherto employed for this Cuckoo apply to it, the question arises as to the earliest undoubted term. The

[1] That is, in Hindustani, the Kyphūl (or fruit of the Ky tree) is ripe.



Genital Glands of Allolobophora longa.

first synonym on the list after those already cited is *C. canoroides*, S. Müller (Verhandelingen nat. Gesch. Nederland. overz. Bez., Land- en Volk. p. 235). It is far from clear that birds belonging to more than one species are not included, and as the wing is said to measure 8½ inches in some of the specimens, those skins, as Seebohm has pointed out, must belong to *C. canorus*. Under these circumstances the name, which is barbarous, may be safely ignored, the more so that it is not clearly antecedent to *C. saturatus*, a name of Hodgson's published by Blyth in 1843 (J. A. S. B. xii. p. 942) and quite unobjectionable. The description given by Blyth (J. A. S. B. xi. p. 903), who regarded this form at the time as an old *C. micropterus*, though brief, was sufficient for its recognition. I propose, therefore, to use the name *C. saturatus* for the Himalayan Cuckoo.

4. Further Observations on Variations in the Genitalia of British Earthworms. By M. F. Woodward, Demonstrator of Zoology, Royal College of Science, London. (Communicated by Prof. G. B. Howes.)

[Received March 15, 1893.]

(Plate XXIV.)

In a former communication on this subject, published in the Society's 'Proceedings' for 1892 (p. 184), I described an abnormal Earthworm (*Allolobophora*, sp. inc.) possessed of six additional pairs of ovaries, situated one on the segment immediately in front of the normal pair and the remaining five pairs on the segments behind it.

I have since examined very carefully a large number of Earthworms belonging to the genera *Lumbricus* and *Allolobophora*, and now find that the presence of additional pairs of genital glands, both ovaries and testes, is of by no means rare occurrence.

In order to form some idea as to the proportion of these abnormal individuals, I took 50 worms at hazard from three localities near London and comprising five species [1], and found 14 specimens, or 28 per cent., in which additional genital glands were present, or, practically, one worm in every four abnormal. The proportion is, however, very variable, as is proved by the fact that whilst most of the abnormal individuals came from one locality, in worms from other places abnormalities were much rarer.

These variations all involved a repetition of the genital glands, but the individuals varied among themselves: thus in four specimens there were present additional glands on the mesenteries

[1] *Allolobophora longa*, 23 specimens: 17 normal, 6 abnormal.
A. turgida, 13 specimens: 9 normal, 4 abnormal.
A. chlorotica, 2 specimens: both normal.
Lumbricus terrestris, 8 specimens: 6 normal, 2 abnormal.
L. rubellus, 4 specimens: 2 normal, 2 abnormal.

numbering 11/12 and 13/14; in five specimens additional glands were present on 11/12 only; in four on 13/14 only; while in one example additional glands were present on 13/14, 14/15, 15/16th [1]. These accessory genital glands were rendered easily visible on dissecting the specimens under spirit, but their real nature could only be made out either by means of sections examined microscopically or, more roughly, by isolating the gland and clarifying it entire.

One specimen was of such exceptional interest that a detailed description is necessary. This was a large sexually adult *A. longa*, possessing well-developed testes on mesenteries 9/10, 10/11, and ovaries on mesentery 12/13. In addition to these glands there were present, on mesenteries 11/12 and 13/14, accessory organs having all the microscopic structure and detailed relationships of true genital glands. The anterior and larger pair of these bodies corresponded in position to the anterior pair of additional ovaries described in my former paper [2], but they differed very much from these both in appearance and shape, being a flattened fan-shaped structure with a slightly branched extremity, resembling the normal testes rather than ovaries (Plate XXIV. fig. 2).

The additional gland of the right side when removed from the body, stained and clarified entire (fig. 2 *a*), was seen to present the following appearance:—Its main mass was composed of a great number of closely-packed, small, rounded cells, imbedded in a slight amount of connective tissue.

The cells situated near the base of the gland were slightly larger and more uniformly diffused than those nearer the middle and free end, which latter showed a marked tendency to be aggregated into masses, roughly resembling the acini of a typical gland. The nuclei of the cells, when seen under a high magnification, present a very characteristic appearance, owing to the arrangement of the chromatin round their periphery. This is a stage in nuclear division which immediately precedes the formation of the nuclear spindle. The presence of all (or nearly all) the cells in this stage of division indicates that nuclear division is here extremely rapid and takes place in most of the cells at the same time; the resting-stage appears to be slurred over, the nuclei emerging from one division and passing straight into the early stages of the next without any marked pause.

If we compare the structure of this body with that of the testes (Plate XXIV. fig. 3), we notice at once the very strong resemblance, in the aggregation of the cells into masses, in the prevalence of this particular division stage in the nuclei, and in the larger size of the cells at the base as compared with those at the free end of the gland.

The only observable differences between the testis and this

[1] Three of the nine specimens possessed of additional genital glands on the 11/12 mesentery had testes developed in this situation, while the remaining six had ovaries.

[2] P. Z. S. 1892, p. 184, pl. xiii., *ov*[1].

accessory gland are the presence, in the latter, of several multinucleate masses of protoplasm, whose nuclei are smaller than those of the surrounding cells and are arranged around the periphery of this mass of protoplasm (fig. 3 *b*). These masses closely resemble the mulberry stage in the development of the spermatozoa, as seen in the seminal vesicles. Moreover, one observed two masses of darkly staining bodies composed of elongated rods (fig. 3 *c*), somewhat bent on themselves, which had all the appearance of nearly ripe sperm bundles, although, owing to their being buried up amongst a mass of cells, it was impossible to make out any flagella in relation to them.

The general structure of this body and the presence in it of undoubted spermatozoa prove, I think, that it is to be regarded as an over-developed testis, which, having no seminal vesicles (receptacula seminis of Beddard [1]) into which to discharge its developing spermatozoa, has retained some of them, at any rate, within its substance until they have become fully developed.

The presence of a third testis is interesting as, except for a description of Perrier's [2], no one has, I believe, ever recorded the presence of additional testes in the Oligochæta [3]. With regard to Perrier's case, one cannot doubt for a moment, on referring to his figures, that Vejdovsky [4] is right in saying that "Perrier's testes are in reality the seminal vesicles." If this be the case, then *Allolobophora* is the first Oligochæte proved to occasionally possess three pairs of testes. This is not the only specimen having this peculiarity, as I have since found two other abnormal forms of *A. longa* in which additional testes were present on the posterior face of the 11/12 mesentery.

Further, when we remember that this testis is developed in exactly the same place as that in which I have described an undoubted ovary in another individual (*l. c.* plate xiii. fig. 1, *ov*[1]), we have further confirmation for the belief that the male and female genital glands in the Oligochæta, at any rate, are homologous structures and may be developed from the same tissue and in the same situation.

Of the left half of the body, longitudinal sections were made so as to pass through the testes, the accessory gland, the ovary, and the segments immediately following (Plate XXIV. fig. 1). On examining the accessory gland in section one immediately noticed, in addition to the general mass of small cells already described, one or two colossal cells (not all visible in the same section), and several moderate-sized ones situated on its dorsal surface (fig. 4). Detailed

[1] This term is not altogether a happy one, as the older Helminthologists applied it with perfect justice to the spermathecæ. Its application to the seminal vesicles, although expressing their undoubted homology with the receptacula ovorum, is apt to cause confusion.

[2] "Recherches p. serv. à l'hist. d. Lumbriciens terrestres," Nouv. Archiv. d. Mus. d'Hist. Nat. Paris, tom. viii., 1872.

[3] Bergh, Zeitschr. f. wiss. Zool. Bd. xliv. 1886, p. 308 (footnote), says "abnormally placed additional testes are never found."

[4] Syst. d. Oligochaeten, p. 135.

examination of these under a high power showed them to consist of a large amount of lightly staining protoplasm, with an enormous central nucleus, whose chromatin was aggregated into one immense nucleolus, staining darkly, while the nucleus itself remained practically unstained.

The general structure of these cells at once suggested ova, and on a careful comparison with the normal ovum (Plate XXIV. fig. 5 *a*, *b*), it will be seen that it is impossible to distinguish the large cells of this accessory gland from ripe ova and the few moderate-sized cells from developing ones [1].

Thus we have in this specimen situated on the 11/12 mesentery, just above the coiled portion of the vas deferens, on the right side a body indistinguishable from a testis, and on the left side one consisting of a ground-mass of testicular tissue, in which are imbedded a few undoubted ova. In other words, we have here on the left side a true hermaphrodite gland, comparable in all its essentials to the ova-testis of a hermaphrodite mollusk, and, like that, budding-off sperm mother-cells into the cœlom, the ova remaining adherent to the wall of the gland until fully formed.

In most hermaphrodite invertebrates known the male and female genital glands are quite distinct from one another; in fact it is only in some Mollusca and a few Crustacea where we find genuine hermaphrodite glands. Bernard has described such a condition in *Apus* [2], where spermatozoa were developed in the ovary; and Ishikawa [3] has discovered the constant presence of ova in the posterior part of the testis of *Gebia*. We have now recorded this condition in a third group of Invertebrata, viz. the Chætopoda.

Leaving on one side the question as to a probably hermaphroditism of the ancestral worms, we may safely regard the ova and sperm mother-cells, the ovaries and the testes as a whole, as being homologous structures among the Oligochæta, for we have seen that ovaries or testes may either develop indifferently upon mesentery 11/12 or be replaced by a true hermaphrodite gland.

I have already pointed out (*l. c.* p. 187) that ovaries may occasionally be developed on the mesenteries 11–18, and now I have only to record the fact that the presence of additional ovaries is much more frequent than has been supposed, especially on mesentery 13/14 (figs. 1 and 6, ov^2) and not unfrequently on 11/12.

A very curious condition in the development of an ovary is seen in the specimen under notice, where a mass of ova, mature and immature, was found in a special cavity surrounded by a thin epitheloid capsule, to which the eggs were attached, immediately under

[1] There seemed just a possibility that these large cells might be encysted Gregarines, and, in order to settle this question, sections were made of the ovary of an Earthworm which had a number of these parasites encysted within it. The difference between these cells and the parasites was at once manifest—the coarsely granular protoplasm and large nucleus with its curiously vacuolated nucleolus of the parasite contrasting strongly with the almost homogeneous protoplasm and compact intensely-staining nucleolus of the ovum.

[2] 'Nature,' vol. xliii. p. 343.

[3] Zool. Anz. xiv. 1891, p. 70.

cover of that ventral oblique septum running back from mesentery 12/13 and situated just below the ovary (Plate XXIV. fig. 7). Save that this capsule was non-vascular and that no opening into the cœlom could be discovered, it was very suggestive of an additional receptaculum ovorum, the contents especially resembling the condition figured by Beddard for *Perichæta*[1]. At first this structure suggested to my mind the curious relations between the oviduct and ovary in *Eudrilus*[1]; but most careful examination of a complete series of sections failed to reveal a trace of any exit from the ova, the cavity of the capsule being closed on all sides. One was thus forced to the conclusion that the organ was merely a ventral extension of the germinal epithelium shut off from the rest of the ovary by the oblique mesentery. The meaning of the special cavity and capsule surrounding this body I am unable to explain.

One of the most striking facts arising out of the study of these various specimens is the very marked potentially reproductive character of the posterior faces of the mesenteric septa, especially Nos. 9/10–13/14; for we have seen that it is not at all uncommon to find genital glands developed on all these, and occasionally even on the next 3 or 4 septa following. As a rule, the germinal epithelium is only developed on the anterior wall of each segment (*i. e.* on the posterior face of the mesentery); but Beddard[2] has, in *Acanthodrilus*, described the ovaries as developed on the posterior wall of the segment (anterior face of the mesentery).

These facts further accentuate the belief in the inherent power of the entire cœlomic epithelium and their derivatives to produce sex-cells.

These varied positions of the genital glands suggest the condition met with in many Polychæte worms, where the genital cells are developed from a more or less continuous band of tissue, situated either on the ventral side of the body-cavity, on either side of the nerve-cords, or close round the ventral blood-vessels[3]. And it seems highly probable that the varying distribution of the genital glands met with in the Oligochæta is the outcome of irregular abbreviation of some such diffuse and possibly hermaphroditic condition under perfected segmentation, rather than of a condition in which the glands were already restricted to definitely metamerically arranged centres as in the Planarians.

The development of the genital glands in the Earthworms has been worked out by Bergh for *Lumbricus* and by Beddard[4] for *Acanthodrilus*: the latter author describes the constant presence of four pairs of gonads in the embryo, the additional pair being situated on the 12th segment; this gland, however, never attains any sexual differentiation and disappears early, so that only three pairs of gonads are found in the adult. This rudimentary pair of glands

[1] Q. J. M. S. vol. xxx. pp. 448, 471, pl. xxix. fig. 12; see also Bergh, Zeitschr. f. wiss. Zool. Bd. xliv. 1886, p. 318 (footnote)

[2] Q. J. M. S. vol. xxx. and vol. xxxiii. p. 514.

[3] Cosmovici, Archiv. Zool. Exp. Gén. tom. viii. 1879–80, p. 357.

[4] Q. J. M. S. vol. xxxiii. p. 497.

is evidently the homologue of the additional gonads on the 12th somite described above in the adult *Allolobophora* and *Lumbricus*; and I believe that when we know more of the development of other Earthworms, this additional pair of gonads will be found to be present in most of them at one stage of their existence.

In three very young worms (*L. terrestris*?) I found this pair of gonads present, and I think that Bergh possibly overlooked it in his account of the development of the genital glands, as, from the number of adult specimens of *Lumbricus* and *Allolobophora* in which I have found this pair of gonads, I think that it is in all probability always developed in the embryo, as in *Acanthodrilus*, but generally disappearing in the adult.

The receptacula ovorum were in this specimen, and as I have frequently observed in other *Allolobophora*, totally disconnected from the oviduct; in fact, if the development of the former be studied (as can easily be done in young worms) they may be found to arise as outgrowths of that portion of the cœlomic epithelium covering the anterior face of mesentery 13/14, dorsal to and quite independent of the oviducts, whose ciliated epithelium may subsequently extend up to their openings. To represent these receptacula ovorum as outgrowths of the oviducts is, I think, erroneous and misleading, as they are the homologues of the seminal vesicles; and, like them, they arise as hollow outgrowths of the mesenteric septa, and their connection with the oviducts (when effected) is a secondary one.

EXPLANATION OF PLATE XXIV.

Fig. 1. Longitudinal vertical section of an abnormal *Allolobophora longa*, ×20. t^2, posterior testis; *f*, seminal funnels; *h*, hermaphrodite gland; ov^1, ov^2, ovaries; *ovd*, oviduct; *m*, mesenteric septa; *s.o*, segmental organ; *n*, nephrostome; *o.m*, oblique mesentery; *c.v.d*, coiled portion of vas deferens.

2. Right additional genital gland (testis) from segment 12.
   a. Entire gland clarified, ×20.
   b. Part of free end, ×320: *m*, mulberry-shaped masses of developing spermatozoa.
   c. Portion showing bundles of ripe spermatozoa (*sp*).

3. Base and apex of normal testis, ×320: *s*, typical sperm mother-cell enlarged.

4. Hermaphrodite gland from segment 12: *ov*, ova; *sp*, young sperm mother-cells, ×320.

5. (*a*) Base of normal ovary, ×640; (*b*) single ripe ovum with archoplasm, ×320.

6. Additional ovary from segment 14, ×320.

7. Mass of ova (? ovary) from below the oblique mesentery (*o.m*) of segment 13: *c.p*, epitheloid capsule, ×110.

April 18, 1893.

Sir W. H. Flower, K.C.B., LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of March:—

The registered additions to the Society's Menagerie during the month of March were 107 in number. Of these 58 were acquired by presentation, 17 by purchase, 5 by exchange, 21 were born in the Gardens, and 6 were received on deposit. The total number of departures during the same period, by death and removals, was 118.

The most noticeable additions during the month were:—

1. Three White-tailed Gnus (*Connochætes gnu*), from the Transvaal (a male and two females), obtained by purchase March 7th.

2. Three Spring-boks (*Gazella euchore*), from South Africa, deposited by H.R.H. the Prince of Wales.

Mr. Sclater exhibited the skin of a singular variety of a (female) Pig-tailed Monkey, *Macacus nemestrinus*, from the Baram River, Sarawak, Borneo, which had been deposited in the Society's Gardens by Major F. Day, on the 13th July, 1892, and had died on the 9th January of the present year. The specimen was of a dark fulvous above, darker in the mesial line, much paler on the lower surface, and growing nearly white on the middle of the chest. Mr. Charles Hose, who was well acquainted with the specimen, had informed Mr. Sclater that it had been captured by the natives of the Baram River about five years ago, and had not grown since it was in captivity. Major Day had obtained it from the Rajah of the district. Mr. Hose had no doubt of its being simply a variety of *Macacus nemestrinus*, in which opinion Mr. Sclater fully concurred, but thought the specimen worthy of notice.

Mr. Sclater read a communication from General Sir Lothian Nicholson, K.C.B., R.E., Governor of Gibraltar, which he had received during a recent visit to Gibraltar.

In reply to inquiries about the present condition of the Barbary Apes (*Macacus inuus*) on the Rock, Sir Lothian stated that they were now distinctly increasing in numbers. He had himself counted as many as thirty in one group, and, according to some reports, there were altogether as many as double that number on the Rock. In fact they were so numerous and their depredations had become so serious that a short time ago an agitation had been got up for their reduction in numbers, and it would perhaps be necessary to thin them a little, but their extermination was quite out of the question and would not be thought of.

Mr. W. L. Sclater, F.Z.S., made some remarks on the Zoological Gardens of Antwerp and Amsterdam, which he had lately visited. In the Antwerp Gardens, amongst other interesting animals, was an example of the Ounce (*Felis uncia*), which appeared to be in good health. The female Hippopotamus which had produced the young male now living in the Society's Gardens was expected to give birth to another young one very shortly.

The following papers were read :—

1. Notes on the Genus *Sipunculus*. By Arthur E. Shipley, M.A., Fellow and Lecturer of Christ's College and Demonstrator of Comparative Anatomy in the University of Cambridge. (Communicated by Frank E. Beddard, F.R.S., F.Z.S.)

[Received March 28, 1893.]

(Plates XXV.–XXVII.)

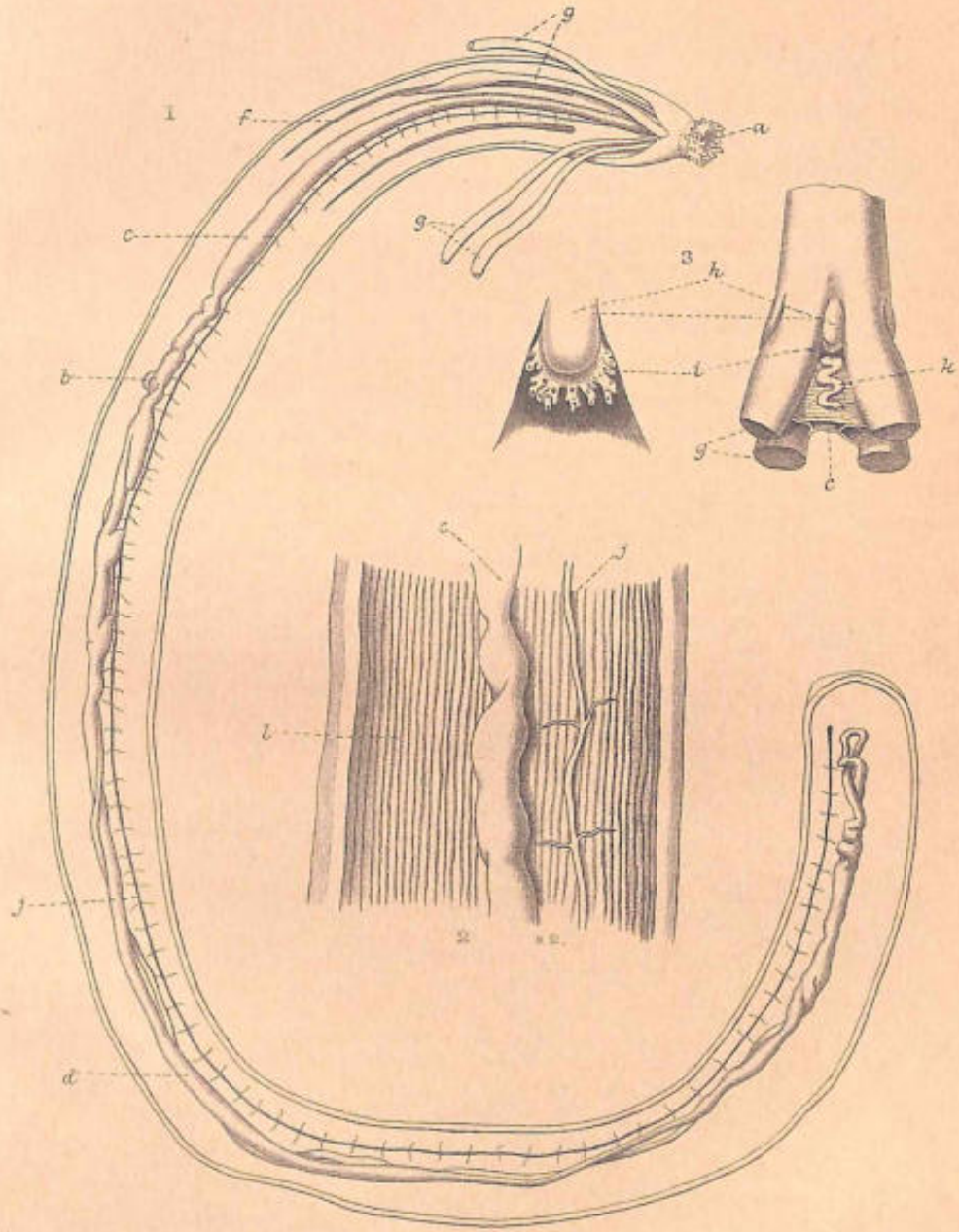
During his recent expedition to Zanzibar, Mr. F. Finn, F.Z.S., collected specimens of two species of Gephyrean worms of the genus *Sipunculus*; these were handed to me by my friend Mr. Beddard, and the following paper contains some notes on the anatomy and histology of these forms, together with a few observations on Sipunculids in general. The two species are *Sipunculus indicus* and *S. cumanensis*; the anatomy of the latter is well known.

Sipunculus indicus.

The exterior of this Sipunculid is well shown in Keferstein's article in the 'Zeitschrift für wissenschaftliche Zoologie' (1), but unfortunately he had only one example at his disposal, and could not investigate the internal anatomy of the animal. The examples which Selenka had to describe for his admirable monograph on the Sipunculidæ (2), although externally well preserved, were so much macerated as to make any investigation of the soft internal organs impossible; he therefore had to content himself with adding a couple of lines to Keferstein's description of the external appearance of the Gephyrean, which he quotes.

Sipunculus indicus is one of the largest species of the genus. The length of the four individuals placed in my hands was 18, 17½, 17, and 15 inches respectively. Their bodies were very attenuated, the average diameter being ¼ to ⅜ of an inch, but their posterior ends were slightly swollen and ended in a truncated cone.

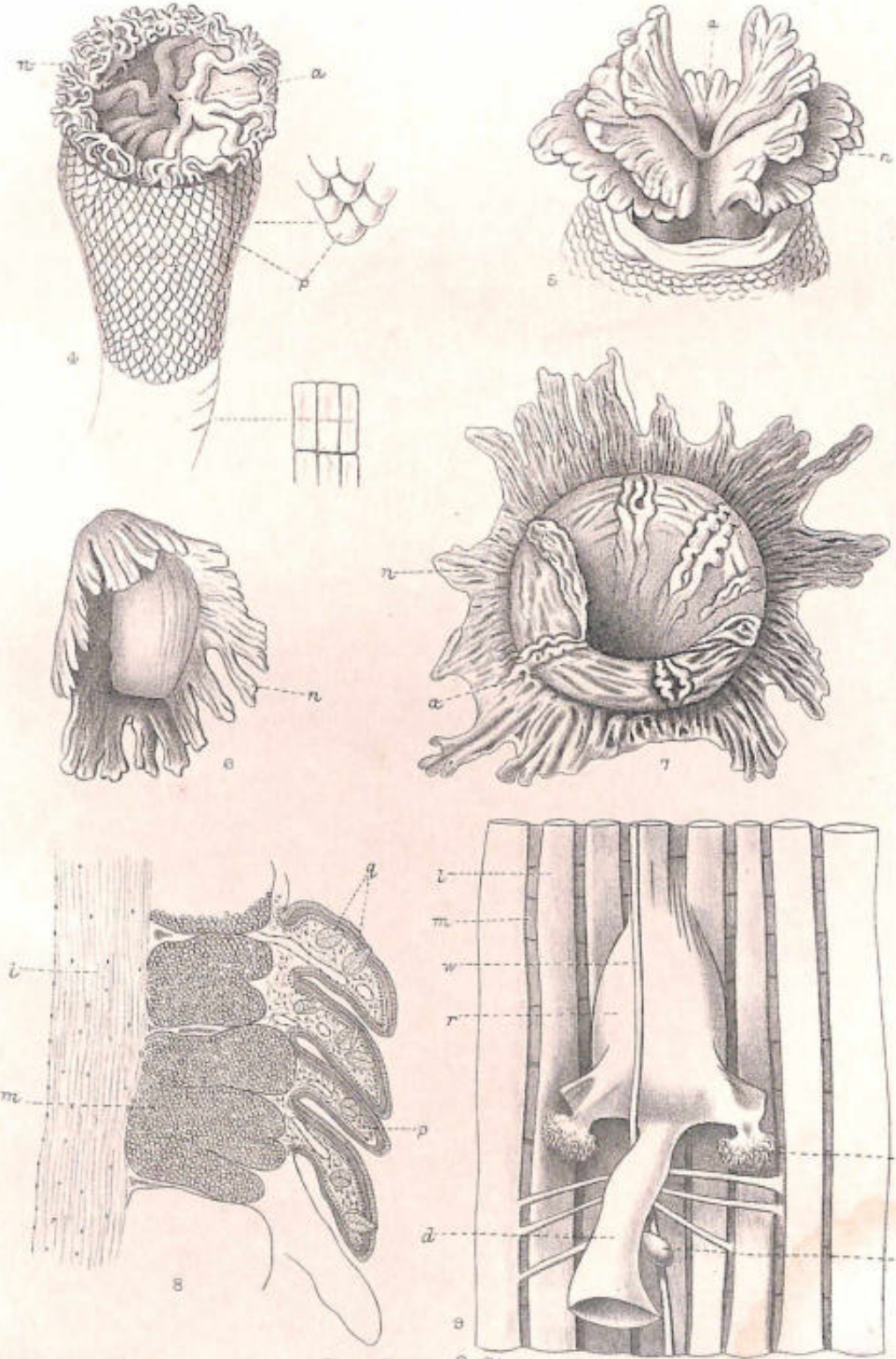
The head of the animal is followed by a short neck (the introvert) covered with scale-like papillæ (Plate XXVI. fig. 4); the rest of the body is very markedly ringed. The rings vary a good deal in their width, but as a rule they are about the same relative size as



Structure of Sipunculus.

M.P.Packer lith.

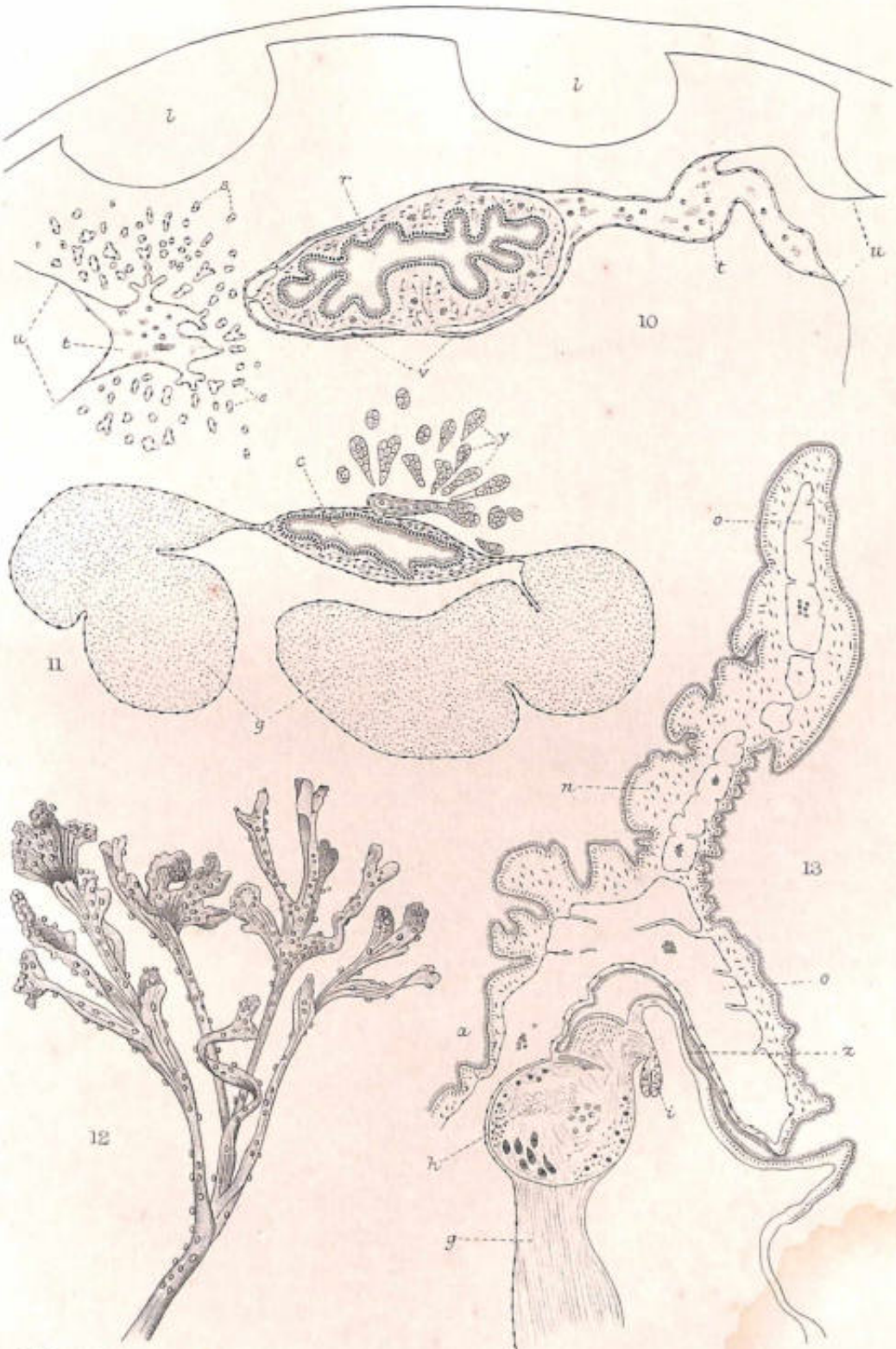
West, Newman imp.



M.P.Pittar lith.

Structure of Sipunculus.

West, Newman imp.



M.P.Parker lith.

Structure of Sipunculus.

West, Newman imp.

those of the Common Earthworm, and their presence gives the *Sipunculus* a remarkable resemblance to that animal. The rings correspond with elevations of the cutis extending over several bundles of the circular muscles which lie just under the cutis. On looking at the skin with a hand-lens it is at once seen that each ring is composed of a number of rectangular oblong areas (Plate XXVI. fig. 4) side by side. Each of these oblong areas corresponds in width with one of the bundles of longitudinal muscles which lie within the circular muscles.

The mouth of *Sipunculus indicus* is situated in the centre of the anterior end of the body; it is slightly elongated transversely (Plate XXVI. fig. 4). Around the mouth lies a circular ring of tentacles, and between the mouth and the ring of tentacles a number (7 or 8) of ridges radiate; probably these correspond with certain vascular spaces which supply the tentacles.

Viewed from in front the mouth and tentacles are very much like those of *Stephanostoma* (*Phascolosoma*) *hansoni* as figured by Danielssen and Koren (4) in their monograph on the northern Gephyrea.

Owing to the fact that Sipunculids usually die with their introvert inverted, the arrangement of the parts of their head has been difficult to make out, and with the exception of the figure given by H. B. Ward (3) it does not seem to me that this part of the body has been adequately depicted. The genus *Sipunculus* differs from many other unarmed Gephyrea in having a ciliated web or membrane round the mouth, which web has not been broken up into discrete and independent tentacles. The arrangement of the web is very various even amongst members of the same species. The simplest form is that presented by *Sipunculus tessellatus* (Plate XXVI. fig. 7), in which the web cannot be said to be broken up into tentacles at all, although its free border is very irregular; it forms a complete ring around the mouth and is not incurved at any point. The inner surface of the web bears numerous ridges and intervening depressions which are lined by ciliated cells. In the specimen depicted in Plate XXVI. fig. 7, some of these ridges were especially marked and continued some way into the mouth. In *Sipunculus indicus* the membrane has been much more broken up into tentacles, which appear more or less aggregated into tufts, and there seems to be a certain relation between the tufts and the conspicuous radial ridges which run toward the mouth. In two of the four specimens which I received from Zanzibar the head was extended: one of them is depicted in Plate XXVI. fig. 4, and it will be noticed in this one that the tentacles are rather thicker on one side, the dorsal, than on the other; in the second specimen with extended head the tentacles were even more concentrated in this region, and showed a tendency to be incurved, so that the outline of their base took the form of a double horse-shoe.

In *Sipunculus nudus* the membrane has not broken up into tentacles, but remains as a web with a ciliated internal surface and

an irregular edge. The extent to which it is developed, however, varies remarkably; it may form but a simple ring (Plate XXVI. fig. 6) as in *S. tessellatus*, or it may be bent in, thus forming a double horse-shoe, open in the middle line dorsally, or finally it may be again bent out as shown in Plate XXVI. fig. 5. This is the most extreme case I have as yet met with in the arrangement of the ciliated membrane round the mouths of members of this genus.

In *Sipunculus indicus* the head is followed by a short neck, from $\frac{1}{3}$ to $\frac{1}{2}$ an inch long, which is covered by a number of flattened scale-like papillæ, which are bent back, and lie over one another like tiles on a roof (Plate XXVI. figs. 4 & 8). Behind the head the body is conspicuously ringed.

The skin presents the usual layers of tissue. Within it is clothed by a layer of peritoneal epithelium; then come the longitudinal bundles of muscle-fibres, 38 to 40 in number (Plate XXV. fig. 2, and Plate XXVI. fig. 8), but decreasing posteriorly by the fusion of neighbouring bundles. At the extreme hindermost end the bundles fuse into a ring, and in this region the cuticle is thickened and hardened. The circular muscles which lie outside the longitudinal are very strongly marked; several of them correspond with each of the rings which are so conspicuous on the body. Neither in the body nor in the neck do they ever fuse into a continuous sheet. Outside the circular muscle layer is a layer of connective tissue, which is limited externally by a columnar tailed epithelium, the epidermis; outside this is a more or less thick coating of cuticle. The connective tissue is a gelatinous-looking tissue with cells scattered through it: prolongations of the body-cavity make their way between the bundles of muscles into this layer and in the region of the neck extend into the scale-like processes (Plate XXVI. fig. 8); these prolongations are seen in the sections to be circular in outline, and to be lined with a layer of peritoneal epithelium; they contain cœlomic fluid, which doubtless serves to nourish the various parts of the skin.

The papillæ which are so characteristic of the skin of Sipunculids are especially common in the scales of the neck of this species. They are not indeed real papillæ, as even their mouths do not project above the ordinary level of the skin. They consist of two or three enormously enlarged cells, presumably epidermal in origin, which are crowded with deeply staining granules; these are apparently poured out from the apices of the cells which are aggregated together near the mouth of the papilla. The cutis is much thickened in the region of the neck and forms the substance of the scale-like projections; over the rest of the body it is thinner, and in places corresponding with the grooves between the rings it disappears almost entirely. It is covered by a uniformly thick cuticle, and numerous papillæ are scattered through it, though they are not so abundant as in the neck. The scale-like projections on the neck seem to be characteristic of the genus *Sipunculus*; no traces of hooks or of the extensile collar, described in *Phymosoma*,

are to be found. Each scale is covered externally by a thin layer of cuticle, and on the upper exposed surface of the scale is a thin granular layer, outside the cuticle. This also shows faint and very fine striations. The papillæ all open upon this surface and never upon the under surface, and it has occurred to me that this outermost layer, confined to the same region of the surface, may be formed by the excretion of the granular cells of the papillæ.

Plate XXV. fig. 1 represents the appearance of one of the four specimens of *S. indicus* laid open by an incision a little to the right of the median line. The alimentary canal is very slender; the mouth and œsophagus are lined by cilia; the anus is situated about the level of the junction of the anterior fifth with the posterior four-fifths of the total body length when fully extended. The descending loop of the intestine is much thicker than the ascending, anteriorly it is prolonged into several short loops. The coils of the two limbs of the intestine are very loose, and I did not detect any spindle muscle; the whole alimentary canal is, however, supported by numerous muscular strands given off from the longitudinal muscles.

There are two brown tubes, which open to the exterior near the posterior end of the introvert. Their internal ciliated frilled opening is at the same level. The diameter of the nephridia is very uniform, and each is attached closely to the body-wall throughout its length by a number of muscle-strands, so that the great inequality of size and position which is frequently noticed in these organs in other species is scarcely possible in *Sipunculus indicus*.

The heart does not extend very far down the œsophagus. It was difficult to make out its exact limit, as this part of the body was embedded in a caked coagulum of the cœlomic fluid. I did not succeed in finding any of the branched diverticula of the dorsal vessel which are not uncommon in other unarmed Gephyrea. These diverticula are well shown in *Sipunculus cumanensis*, and a section through the œsophagus of this form is drawn in Plate XXVII. fig. 11.

There are four retractor muscles which arise from about the same level, almost halfway between the mouth and the anus. The ventral nerve cord is conspicuous; it gives off very numerous paired nerves which pass into the skin. At the posterior end of the body it is swollen into a small lump. I was not able to detect any traces of generative ridges.

The Projections in the Brain.

The curious finger-like projections on the dorsal surface of the brain in the various species of *Sipunculus* have received but little attention on the part of zoologists. Andreæ and Ward mention them, and the former states that they appear to be hollow; this is, however, not the case.

They are comparatively conspicuous objects, and are easily seen when the brain of a *Sipunculus* is examined through a lens; in

Sipunculus nudus they are finger-formed; in *Sipunculus tessellatus* they are fused into a membrane at their base and at their free ends are somewhat branched. In the last-named species they bear certain pigmented spots, which are shown in Plate XXV. fig. 3. They project into the body-cavity between the dorsal retractor muscles on the dorsal aspect of the brain.

Sections throw but little light on the nature of the structures. They are covered by a layer of cells continuous with those covering the brain, and they are not ciliated. They are solid and consist of a number of connective-tissue cells, and they are rather richly supplied with nerve-fibres. Beyond the fact that they receive a somewhat more abundant nervous supply than other organs there is nothing in their structure to suggest that they are sense-organs, and I am quite unable to surmise what their function may be.

Plate XXVII. fig. 13, which was drawn with the view of showing the position of these structures, is a section near the dorsal middle line of the fringe-like lophophore of *S. nudus*. It shows the relation of the brain to the dorsal blood-vessel, the ventral half of the central nervous system being bathed by the blood in this tube. The dorsal blood-vessel is continued on into the lophophore and breaks up into numerous lacunæ, which when charged with blood serve to extend these parts. The same figure shows the attachment of the retractor muscle to the base of the brain, the giant cells in the latter, and the area where the brain is continuous with the epidermis, and the ciliated pit leading to this. This latter has been very accurately and fully described by H. B. Ward under the name of the cerebral organ.

The Rectal Diverticula.

There are in most members of the genus *Sipunculus* two feathery structures attached to the rectum in the immediate neighbourhood of the anus. These, like the papillæ on the brain, project into the cœlom and are bathed on all sides by the cœlomic fluid. If a small piece of these bodies be examined under the microscope it is seen to have a very branching, frayed appearance, somewhat resembling a minute sea-weed (Plate XXVII. fig. 12). The terminal branches are somewhat swollen, and show no trace of any pore or opening, such as are found in the terminal branches of the anal cæca of *Bonellia* and some other armed Gephyrea.

The following description applies to these organs in the species *Sipunculus nudus* and *tessellatus*. In stained specimens the nuclei are very prominent; they are apt to stand out from the surface of the structures, and in some cases seem to have absolutely separated off from the body of their cells. Whether this is really the case or not I cannot say, as I have not been able to examine fresh material, and that which I had at my disposal was not well enough preserved to permit the determination of this point.

The branches gradually collect together and end in one main trunk, and this opens, not, as I expected to find, into the alimentary

canal, but into a well-developed system of lacunar spaces which lies in the thick walls of the rectum.

Section shows that the whole organ is hollow; the walls of the finer branches are one cell thick, and these cells seem to be shedding their nuclei into the surrounding medium. The lumen of the branches, and more especially of the main trunk, contains a granular coagulum in which numerous spherical granular corpuscles are embedded; these latter have very much the appearance of the nuclei described above as being given off from the cells of the branches, and it is quite possible that the latter are not all nuclei, but some of them may be bodies elaborated in the lumen of the organ and passing through the walls to the exterior, that is, into the cœlomic fluid.

The lacunar spaces into which these organs open are well defined (Plate XXVII. fig. 10); they can be recognized without the aid of sections, for if the rectum be cut out and examined under a lens it becomes apparent that it consists of a thick inner tube surrounded by a thinner, looser tube, which is supported by four longitudinal mesenteries attached to the body-wall (Plate XXVI. fig. 9). The space between the outer and inner tubes is the space into which the rectal diverticula open, and its cavity contains a coagulum similar to, and continuous with, that in the cavity of the branching organ. The lacunar spaces do not extend any great distance along the intestine, but are confined to a short track about $\frac{1}{2}$ an inch long; they are split up by numerous strands of connective tissue which run between the outer and inner walls of the rectum.

Until I came to investigate minutely the structure of the anal tufts I had always regarded them as homologous with the anal cæca of *Bonellia*, &c. Both their appearance and position seemed to support this view. Closer study, however, shows that the structures in *Sipunculus* differ very considerably from those in *Bonellia*. In the first place, they do not open into the cœlom: the ciliated funnels at the end of the branches in the anal cæca of armed Gephyrea are well known, nothing of the sort is found in *Sipunculus*. Secondly, they do not open into the lumen of the intestine but into a well-developed system of lacunar spaces in the wall of the rectum. These differences seem to throw much doubt on the view that any homology exists between these structures in the two groups.

If we may make any inference from the structure of the gland to its function, it appears probable that this branching gland has somewhat the same functions as the lymphatics and the numerous glands which in all classes of animals exercise some influence on the constituents of the circulating medium.

List of Papers referred to.

(1) KEFERSTEIN, W.—"Beiträge zur anatomischen und systematischen Kenntniss der Sipunculiden." Zeitschr. f. wiss. Zool. Bd. xv.

(2) Selenka, E.—Die Sipunculiden. Eine systematische Monographie. Reisen im Archipel der Philippinen, Bd. iv. Abth. 1.

(3) Ward, H. B.—"On some Points in the Anatomy and Histology of *Sipunculus nudus*, L." Bulletin of the Museum of Comparative Zoology at Harvard College, vol. xxi. No. 3.

(4) Danielssen and Koren.—Gephyrea. Den Norske Nordhaus-Expedition. Part iii.

EXPLANATION OF THE PLATES.

List of Reference Letters.

a. Mouth.
b. Anus.
c. Œsophagus.
d. Intestine.
f. Nephridia.
g. Retractor muscles.
h. Brain.
i. Digitate process of Brain.
j. Ventral nerve-cord.
k. Dorsal blood-vessel.
l. Longitudinal muscles.
m. Circular muscles.
n. Tentacular fringe.
o. Sinuses in the same.
p. Scales on the introvert.
q. Papillæ on scales.
r. Rectum.
s. Rectal tufts.
t. Ducts of rectal tufts.
u. Mesenteries supporting these ducts.
v. Sinuses in wall of rectum.
w. Spindle muscle.
x. Cæcum on intestine.
y. Diverticula of dorsal vessel.
z. Ciliated pit leading to brain.

Plate XXV.

Fig. 1. View of a *Sipunculus indicus* cut open by an incision a little to the right of the dorsal middle line. The introvert is extended and the viscera are exposed *in situ*. The drawing is ⅔ the natural size.

2. A portion of the same in the region of the œsophagus, magnified two diameters, to show the numerous bands of longitudinal muscles.

3. Two views, magnified, of the brain of *Sipunculus tessellatus*. The fig. to the right shows its position above the œsophagus and between the dorsal retractors. The fig. to the left is more highly magnified, to show the character of the digitate processes.

Plate XXVI.

Fig. 4. A view of the head of *S. indicus*. The mouth is shown in the centre, and between it and the ring of tentacles run several vascular ridges. To the right are two sketches, more highly magnified, to show the characters of the scales on the introvert and the square areas in the trunk.

5. A dorsal view of the head of *S. nudus* with the tentacular fringe very much folded, × 4. The mouth is away from the spectator and the depression leading to the brain is near him.

6. A ventral view of another specimen of *S. nudus*, in which the fringe is not at all folded, the wall of the œsophagus is bulged forward and obliterated the oral orifice.

7. An anterior view of the mouth of *S. tessellatus*.

8. A longitudinal section through the skin of the introvert of *S. indicus*, showing the structure of the scales, the prolongations of the body-cavity into them, and the 'papillæ.'

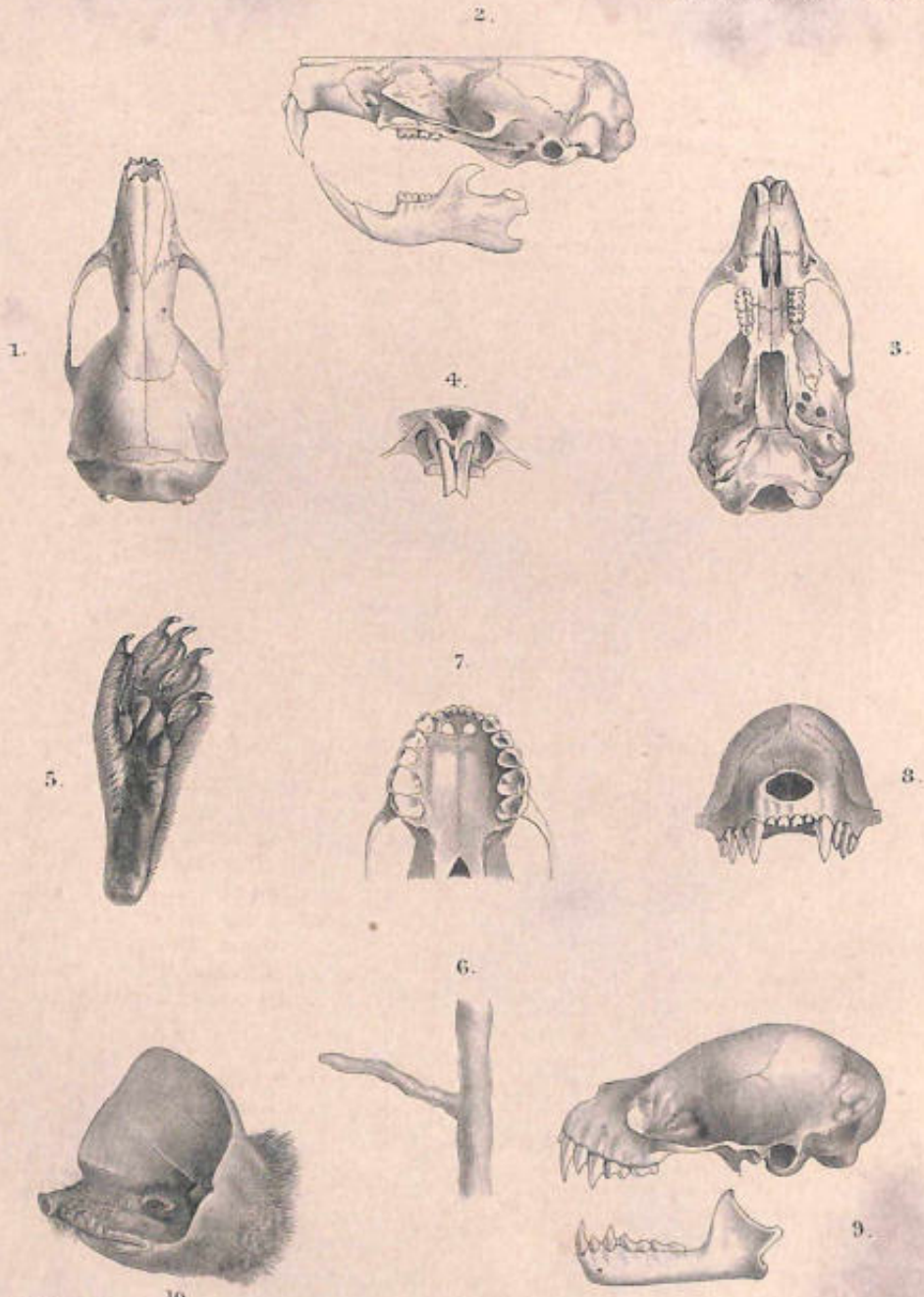
9. A view of the rectum of *S. tessellatus*, showing the anal tufts, the enlargement of the alimentary canal to form the rectum, the spindle muscle, the muscular strands supporting the intestine, the cæcum opening into the latter, and the longitudinal and circular muscles of the skin.



J. Smit del. et lith.

Mintern Bros. imp.

ICHTHYOMYS STOLZMANNI.



P. Smit del. et lith.

Mintern Bros. imp.

FIGS. 1–6. ICHTHYOMYS STOLZMANNI.
" 7–9. ARTIBEUS GLAUCUS.
" 10. NYCTINOMUS KALINOWSKII.

PLATE XXVII.

Fig. 10. A transverse section through the rectum of *S. tessellatus*, to show the arrangement of the rectal tufts. On the left are scattered portions of the tufts surrounding and opening into the main duct, which is supported by two mesenteries. The section is cut obliquely, and on the right it passes beyond the tufts but through the duct, and the communication of the latter with the lacunar spaces in the wall of rectum is shown. The outlines of the skin and of the longitudinal muscles in section are shown above.

11. A transverse section through the œsophagus of *S. cumanensis*. Above the œsophagus is seen the dorsal blood-vessel with diverticula opening into it, other diverticula crowded with blood-corpuscles are shown in various planes. The retractor muscles are seen at the side.

12. A branch of the rectal tufts of *S. nudus*, highly magnified.

13. A section taken through the tentacular fold and brain of *S. nudus*. The ciliated coating of the fold and the numerous blood spaces in its walls are shown. Below, the latter open into the dorsal blood-vessel which bathes the ventral surface of the brain. The ciliated pit leading to the anterior surface of the brain, which is continuous with the epidermis, is shown, and also the digitate processes which project into the cœlom. The mouth and œsophagus lie to the left.

2. On some Mammals from Central Peru.

By OLDFIELD THOMAS.

[Received April 7, 1893.]

(Plates XXVIII & XXIX.)

I owe to the kindness of Dr. Jean Stolzmann, the Director of the Branicki Museum, Warsaw, the opportunity of working out a small collection of Mammals obtained in Central Peru by Mons. J. Kalinowski, which contains examples of several species either new or of such interest as to deserve a record.

The locality at which most of the specimens were obtained is Chanchamayo, near Tarma, approximately in lat. 11° 20′ S., and long. 75° 40′ E.; in fact in very nearly the same region as the specimens collected by Mons. C. Jelski and described by me in 1884 [1]. The altitude of Chanchamayo is about 3000 feet.

The most remarkable of the species to be described is the interesting fish-eating Rat, *Ichthyomys stolzmanni*, which I have named in honour of the distinguished Polish ornithologist and collector, to whom I owe the pleasure of working out the specimens. There are also two new Bats.

Mons. Kalinowski is much to be congratulated on the excellent manner in which he has collected the specimens, the care he has devoted to the preservation of the skulls, and on the interesting discoveries he has made in a region evidently very far from worked out.

Thanks to the kindness of Dr. Stolzmann, the British Museum has been permitted to acquire, by way of exchange, the majority of the specimens now described.

[1] P. Z. S. 1884, p. 447.

1. NYCTIPITHECUS TRIVIRGATUS.

a, *b*. Ad. sks. ♂ ♀. Chanchamayo. 5/9/90.

2. VESPERUS FUSCUS, P. de Beauv.

a. Ad. al. ♂. Chanchamayo.

3. SACCOPTERYX LEPTURA, Schr.

a. ♂ al. Chanchamayo.

4. SACCOPTERYX BILINEATA, Temm.

a, *b*. 2 ♂ al. Chanchamayo.

As Dobson has remarked, these two species of *Saccopteryx* seem to be merely large and small races of a single form, exactly as in *Molossus rufus* and *M. obscurus*. The difference in size, however, is, in the one case as in the other, so great and so constant as to make it convenient to treat them all as distinct species so far as nomenclature is concerned.

5. MOLOSSUS OBSCURUS, Geoffr.

a–*e*. 5 in al. Central Peru.

6. NYCTINOMUS KALINOWSKII, sp. n. (Plate XXIX. fig. 10.)

Size very small, perhaps the smallest of the genus in the general bulk of the body. Lips slightly wrinkled. Ears not conjoined in front, but arising from the same point on the muzzle; their substance very thin and transparent; their inner margin evenly but faintly convex, without minute horny points; tip rounded off, but fairly defined, not lost in the general convexity, as is often the case; outer margin slightly convex for its upper, concave for its middle, and convex again for its lower third, but the curves are very slight and open, and there is practically no antitragus at all, the notch marking this lobe behind being almost obsolete; as a general result the line of the conch runs almost evenly from the tip to the insertion behind the angle of the mouth, a character, I believe, unique in the genus.

Keel of ear-conch very much reduced, and forming a mere narrow rim, barely a millimetre broad at its broadest point; its edge not thickened or bent round in any way. Tragus well developed, quadrangular, its upper nearly equal to its inner edge.

No trace of a gular sac, at least in the female.

Wing-membrane from the ankle. Fur very short and close, extending on the upper surface of the wing-membrane only as far outwards as a line drawn from the middle of the humerus to the middle of the femur; a few minute scattered hairs behind the forearm.

Colour pale fawn-grey, rather paler below than above; wing-membranes black, edged posteriorly with white. Membrane of ears whitish.

Teeth too much worn down in the type for proper description;

premolars only $\frac{1}{2}$, the anterior one above *perhaps* lost, and not really absent normally. Lower incisors 4.

Measurements of the type, an aged female in alcohol:—Forearm 34·5 mm. (=1·35 in.); head and body 46; tail 28; head 18; ear from notch 14·5; both ears, tip to tip across head, 25·5; tragus 4; metacarpus of third finger 35, of fifth 22; lower leg 8; hind foot 7.

Hab. Central Peru.

This interesting little species differs widely from any of the previously known Neotropical *Nyctinomi*, and seems to approach some of the members of the group called *Mormopterus* by Peters, notably in the extreme reduction of the keel of the ear-conch, and in the absence of the upper anterior premolar; in fact, of all the known species, the Australian *N. norfolcensis*, Gray, appears to resemble it most nearly, although whether this resemblance really amounts to relationship, I am not at present prepared to say.

It is with great pleasure that I connect with this new Bat the name of its discoverer, M. Kalinowski, to whose labours we owe the valuable collection of small Mammals described in the present paper.

7. PHYLLOSTOMA HASTATUM, Pall.

a, *b*. 2 ad. al. ♂ ♀. Chanchamayo.

8. GLOSSOPHAGA SORICINA, Pall.

a–*d*. 4 in al. Central Peru.

9. ANURA GEOFFROYI, Gray.

Anoura geoffroyi, Gray, Mag. Zool. Bot. ii. p. 490 (1838) (excl. syn.).

Chœronycteris peruana, Tschudi, Faun. Per., Mamm. p. 71 (1844).

Glossonycteris lasiopyga, Pet. MB. Ak. Berl. 1868, p. 365; Alston, Biol. Cent.-Am., Mamm. p. 45 (1879).

Glossonycteris geoffroyi, Dobs. Cat. Chir. B. M. p. 508 (1878).

a. Imm. al. Central Peru.

As the synonymy shows, Dobson and Alston have each thought it necessary to use a different name for this species, different both from each other and from that of the original describer, Gray. On reviewing the whole case, it appears to me that Dobson was right in considering the species named *geoffroyi* sufficiently characterized by the diagnosis given by Gray under the generic heading of "Anoura," *A. geoffroyi* being the only species. This being the case, it is also clear that *Anura* must be used for the genus, as the name had not been previously used in a generic sense in zoology. For both genus and species, therefore, I use the earliest name, verified as the identification is by the existence of Gray's type specimen.

The occurrence of this species in Peru confirms the reported identity of Tschudi's "*Chœronycteris peruana*" with it.

10. ARTIBEUS[1] GLAUCUS, sp. n. (Plate XXIX. figs. 7–9.)

a. ♀ al. Chanchamayo. *Type*.

Dentition as in the restricted subgenus *Artibeus*, of which the only known member is the large "*A. perspicillatus*," whether that is or is not subdivided into four or five local "species." Size as in the little *A.* (*Dermanura*) *cinereus*.

Anterior edge of nose-leaf free, its sides without extra lobes, its upright portion rather narrow and elongated. Ears rather short, their inner edge and tip broadly rounded, their outer edge with two slight concavities separated by a convexity. Wings to the end of the metatarsus. Interfemoral membrane emarginate to a point rather above the level of the middle of the tibia.

Fur above extending on to the proximal half of the foramen and base of antebrachial membrane, and there is a patch on the metatarsus of the thumb. The wings are covered as far as a line extending from the elbow to the knee, the interfemoral is thinly clothed on its basal half, and the legs are covered with fur right down to the claws. Below there is a sparse covering on the membrane near the body and on the base of the forearm, but the interfemoral membrane is almost naked.

Colour uniform cinereous grey, the lower surface scarcely lighter than the upper. Two faint whitish supraorbital streaks just distinguishable.

Skull in its general outline almost as elongated as that of *A. bilobatus*, and sharing with that species in the less abrupt rise of the brain-case above the level of the muzzle; but while in *A. bilobatus* it is the muzzle that is raised, in *A. glaucus* it is the brain-case which is depressed, so that there is no really close resemblance between the two. General palatal outline broader and shorter than in *A. bilobatus*, but not so much so as in *A. cinereus* and *quadrivittatus*.

Teeth. Upper inner incisors broad, vertical, spatulate, bicuspid, the inner cusps slightly longer than the outer. Outer incisors about half the height of the inner. Upper canines and premolars rather short and thick. No trace of $\underline{m^3}$, although $\underline{m^2}$ has a slight and inconspicuous concavity in its posterior edge. Lower incisors equal, bicuspid; lower canine and posterior premolar attaining the same altitude; $\overline{m^2}$ of about the same horizontal length as $\overline{m^1}$; $\overline{m^3}$ rounded, minute, its size in cross section only about equal to that of one of the lower incisors.

Dimensions of the type, a slightly immature female[2] in spirit:—Forearm 43 mm.; head and body 51; ear from notch 15·5; nose-leaf, length 11·7, breadth of horizontal part 6·1, of upright part 4; length of thumb 9·3; tibia 15·2; foot 10; calcar 4·1; depth of interfemoral in centre 7.

[1] There appears to be no reason why this name should not be retained as originally formed by Leach, or why Agassiz's derivation of it from *ἄρτι* and *βάω* should be rejected; Winge's proposed amendment of it to *Artobius* ('Bats of Lagoa Santa—E Mus. Lundii,' p. 38, 1892) is therefore unnecessary.

[2] Teeth all up and in use, but epiphyses of limb-bones not fully united.

Skull—basal length 17 ; greatest length 20·8 ; zygomatic breadth 12 ; intertemporal breadth 5·6 ; palate, length 9·5, breadth outside $\overline{m^1}$ 8·6, inside $\overline{m^1}$ 4·4 ; front of canine to back of $\overline{m^2}$ 6·5 ; ditto in lower jaw 6·9 ; horizontal length of $\overline{m^1}$ 2·0, $\overline{m^2}$ 1·8, $\overline{m^3}$ 0·4.

There is no necessity for any comparison of this species with its allies, as its dental formula distinguishes it at once from all except the *A. perspicillatus* group, of which the smallest member is of at least three or four times its bulk.

A. glaucus is perhaps Tschudi's "*Phyllostoma pusillum*, Natt."[1], but has clearly nothing to do with Natterer's species, which was placed by Dobson in the genus *Chiroderma*, and later on transferred by myself to *Vampyrops*[2].

11. Sciurus variabilis, Geoff.

a. Ad. sk. ♂. Chanchamayo.

12. Sciurus chrysurus, Puch.

a. Ad. sk. ♂. La Gloria, Chanchamayo.

13. Rhithrodon pictus, Thos.

a. Ad. sk. San Blas, Cordilleras, 18000 feet. 30/4/90.

14. Ichthyomys stolzmanni, g. & sp. nn. (Plate XXVIII. and Plate XXIX. figs. 1–6.)

Ichthyomys, g. n.

Form modified for an aquatic piscivorous life.

Head markedly depressed, so as to give its side view a resemblance to that of a snake. Eyes and ears small. Whiskers long, stout, and prominent. Fur short and close. Hind feet (Plate XXIX. fig. 5) very broad; toes partially webbed, broadly and closely ciliated on each side ; their soles, naked, with five broad low pads. Tail long, cylindrical, but increased in height vertically by having its under surface clothed with short elongated bristles.

Cæcum (fig. 6) much reduced in volume, very short, and only of the same diameter as the rectum. Small intestine of medium length ; colon and rectum proportionally short.

Skull (figs. 1–4) curiously like that of *Hydromys*, its dorsal outline concave over the orbits, flattened and depressed throughout. Supraorbital edges smoothly rounded, without any trace of ridges ; supraorbital foramina proportionally large, not within the orbit, but upon the top of the interorbital space. Infraorbital foramen exactly as in *Hydromys*, as broad below as above ; anterior zygoma-root very short horizontally, its anterior edge vertical, not projecting forwards. Zygomata extraordinarily weak, not properly ossified at the junction of the malar with the maxillary process. Palatine foramina of medium length.

Teeth. Incisors with their front surfaces so turned in towards

[1] Faun. Peruana, p. 63 (1844).
[2] Ann. Mag. N. H. (6) iv. p. 170 (1889).

each other that their faces form a V in horizontal section, and owing to this and to an apparently greater thickness of the enamel at their outer as compared to their inner margins, their cutting-edges also form a vertical reversed Λ, the outer corners projecting downwards as sharp divergent points, of obvious use in seizing fish. Molars somewhat of the *Habrothrix* type, but simpler, with high crowns, and opposite, not alternating, cusps, of which there are six in the first and four in the second molar both above and below, although the two most anterior below tend to fuse into one another. M^3 above and below subtriangular, of average proportional size.

Type: *I. stolzmanni*, described below. "*Habrothrix*" *hydrobates*, Winge, should also be included in the genus.

This remarkable new genus is one of very great and special interest, on account of the fact that its members are modified, not merely for an aquatic life, as are many other rodents, but actually for a predacious piscivorous one, almost unique within the order. This fact is fortunately proved without question by the discovery, in the stomach of the Peruvian specimen now before me, of both scales and fish-bones, which have been identified by my colleague, Mr. Boulenger, as those of *Tetragonopterus alosa*, Günth., a fish with an average length of about six inches.

That the habits of *Ichthyomys* were in some way very peculiar might have been inferred from the striking modification of the upper incisors, of which the sharp separated points would apparently be almost useless for the gnawing phytophagous life of most rodents, whether aquatic or not, while the extreme degree of specialization in the swimming characters would result in an activity and speed under water fully capable of rivalling that of fishes or batrachians, and very different from that of ordinary water-rats. *Fiber*, however, and *Hydromys*, of Myomorph rodents, are also both about equally endowed with swimming-powers, and although both are primarily plant-eaters, yet the former certainly occasionally captures and eats slow-swimming fishes [1], and perhaps the latter also will prove to do so, especially as it has a tendency towards the peculiar double-pointed character of the upper incisors present in *Ichthyomys*, and also a very decided resemblance to it in the general shape and structure of the skull. At the same time neither of these forms has the peculiar physiognomy of *Ichthyomys*, whose general expression bears a considerable resemblance to that of such exclusively fish-eating mammals as *Lutra*, *Myogale*, and *Potamogale*.

On the whole the balance of evidence appears to be in favour of *Ichthyomys* not being a plant-eater at all, but of its living entirely on fishes, batrachians, crustaceans, or other water animals.

Dr. Winge, in the description of his *Habrothrix hydrobates*, has entered into detailed comparisons of it with many water-mammals, but owing to his specimen having been a skin only, he was unable to make any investigation as to the character and contents of the intestines. But, nevertheless, his placing *I. hydrobates* in the

[1] See Merriam, Tr. L. Soc. New York, ii. p. 187 (1884).

genus or subgenus *Habrothrix* appears to me quite unaccountable, especially as he is one of the authors who consider that the majority of the different groups of what used to be called "*Hesperomys*" should rank as distinct genera. A short diagnosis of *Habrothrix*, based on the typical species, *H. longipilis*, is given in P. Z. S. 1884, p. 450, and it will be seen that *Ichthyomys stolzmanni* and *I. hydrobates* agree with that diagnosis in scarcely a single character of importance, even though it was not drawn up with the idea of any antithesis to such a specialized swimming form as the present.

The very noticeable resemblance in the structure of the anterior zygoma-root which *Ichthyomys* bears to *Hydromys* is a point well worthy of remark, for while this resemblance practically amounts to identity, yet there can be no suspicion that the two have a common origin, or can be other than a very remarkable case of parallelism. This case is the more remarkable as the structure of this region has been used by all the best authorities as a character of primary importance in dividing the Myomorph rodents into smaller groups, so that it will not be readily looked upon as one of little stability. Nevertheless, in the present instance we have two Murines, alike in their mode of life but derived from quite different ancestors, developing independently exactly similar infraorbital foramina[1]. The presumed ancestor of each of the two highly specialized forms under consideration, *Xeromys* of *Hydromys*, and *Habrothrix* (or some ally) of *Ichthyomys*, both have typically murine infraorbital foramina.

ICHTHYOMYS STOLZMANNI, sp. n. (Plate XXVIII.)

Size and general proportions much as in the common Black Rat (*Mus rattus*). Whiskers long, strong, and numerous, silvery white with the exception of a few of the upper ones, which are brown. Ears very small and narrow, when laid forward they do not reach halfway towards the eye. Hands with the fingers quite free and unwebbed; pollex with a sort of elongated nail, not long enough to be called a claw; other digits with sharp curved claws; third and fourth fingers subequal, second reaching to the middle of the second phalanx of the third, fifth to the base of the same phalanx of the fourth; palm naked, with the usual five pads. Hind feet broad, fan-shaped; unwebbed part of toes broadly ciliated marginally; soles naked, with five large low rounded pads, the usual small postero-external pad absent. Tail about as long as the head and body, thick, cylindrical, its terminal half below with stiff elongate bristles. Palate-ridges 3—3. Mammæ doubtful, owing to part of the abdominal wall having been cut away, but there is one pair just behind the axillæ, and another near the vulva;

[1] Dr. Winge (*l. c.* p. 22) ingeniously suggests, as the reason of the enlargement in the lower part of the foramen, the increased size of the nerve which supplies the prominent whisker-bristles. Although no doubt true so far as it goes, this explanation does not appear to me quite to cover the case, especially as *Fiber*, similar in habits and with nearly equal whisker development, has a highly typical Murine foramen.

Dr. Winge says of *I. hydrobates*, that there are "at least one pair on the breast, and two on the belly."

Fur short, close, and thick, very similar in texture to that of *Holochilus apicalis* or *squamipes*. General colour above mouse-grey, strongly grizzled with fulvous; upper half of ear-margin brown, lower white. Chin, chest, and belly dirty white, the hairs grey basally, dull white terminally. Upper surface of hands and feet pure white, except that the metacarpals are slightly tinged with brown; cilia of hind feet also pure white. Tail abruptly bicolor, brown above, and pure white below throughout its whole length.

Skull apparently quite as in *I. hydrobates* (see figures 1–4, Plate XXIX.), except that the anterior palatine foramina seem to run further back, ending exactly opposite the most anterior point of $\overline{m}$.

Dimensions of the *type*, an adult female in alcohol:—

Head and body 146 mm.; tail 148; hind foot 36; ear, from notch 9·1, breadth 6·2; forearm and hand 33·5.

Skull—basal length 30·5; greatest length 34; greatest breadth 16; nasals, length 11, greatest breadth 4·2; intertemporal breadth 5; interparietal length 2·5, breadth 7·1; palate, length 17·3, breadth outside $\overline{m^1}$ 6·1, inside $\overline{m^1}$ 3·1; diastema 8·9; palatine foramina, length 6·5; length of upper molar series 4·4; basi-facial length 19; basi-cranial length 11·5; lower jaw, condyle to incisor tips 22.

Hab. Chanchamayo.

This species differs from *I. hydrobates* in its rather larger size, its more elongated palatine foramina, and especially in its wholly bicolor tail, that member in the allied form being brown above and below, except just at the tip, which is whitish[1]. *I. hydrobates* is a native of the Sierra de Merida, Venezuela, some thirteen or fourteen hundred miles north of the home of *I. stolzmanni*, but, speaking broadly, upon the same eastern slope of the great Andean chain.

I have great pleasure in connecting with this handsome animal the name of Dr. Jean Stolzmann, himself one of the best-known and most successful Peruvian collectors, the discoverer of many new Mammals[2], through whose kindness I am now enabled to describe the present interesting set of mammals.

15. LAGIDIUM PALLIPES, Benn.

a. Ad. sk. ♀. Incapirca, Zezioro, Junin. 8/5/90.

16. DASYPROCTA VARIEGATA, Tschudi.

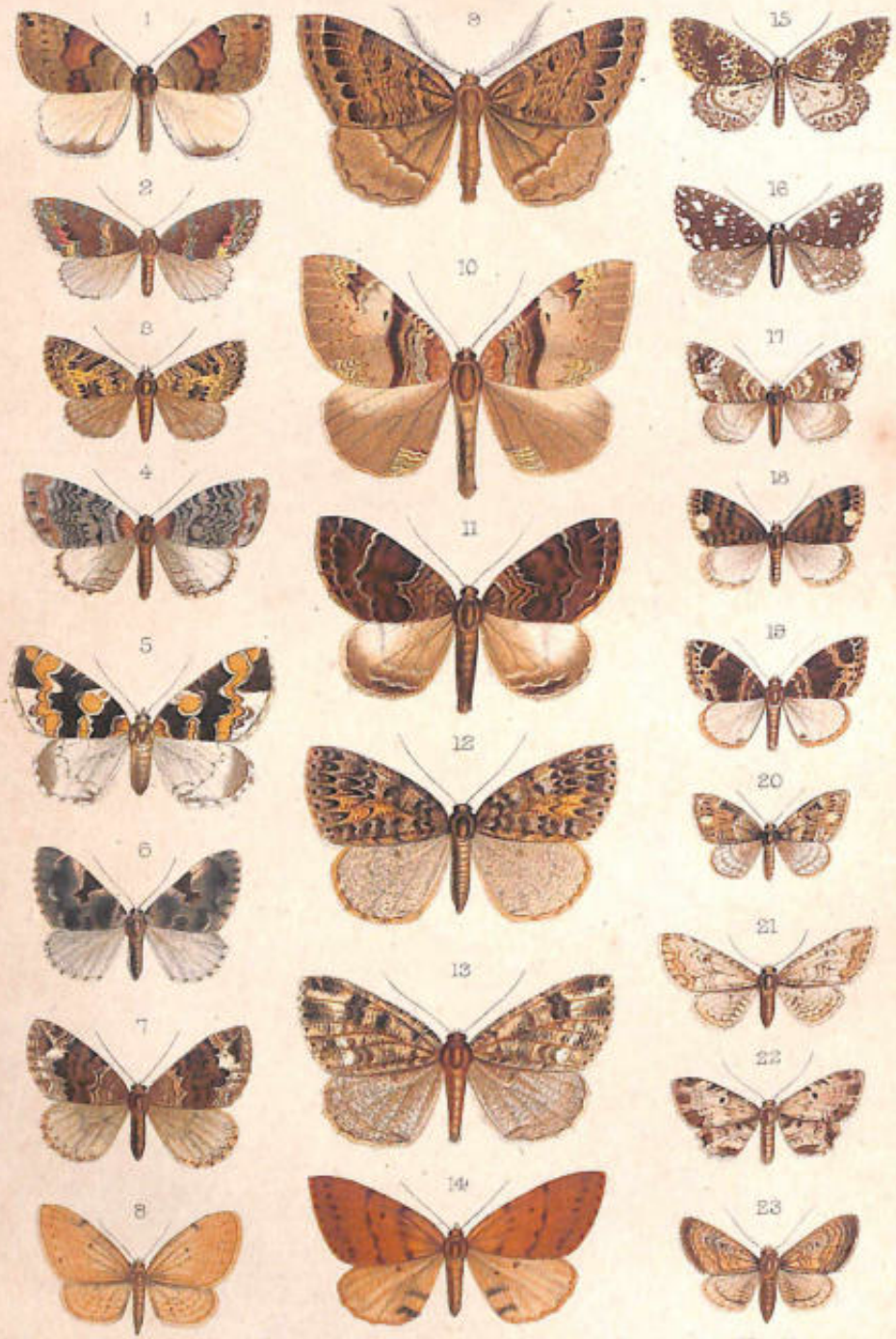
a–c. Ad. ♀ and 2 yg. sk. Chanchamayo. 5/9/90.

17. CAVIA CUTLERI, Benn.

a. Ad. sk. ♀. Incapirca, Zezioro, Junin. 20/6/90.

[1] This coloration of the tail is again curiously suggestive of *Hydromys*.

[2] See P. Z. S. 1882, p. 98.



H.Knight del et lith.

West, Newman chromo.

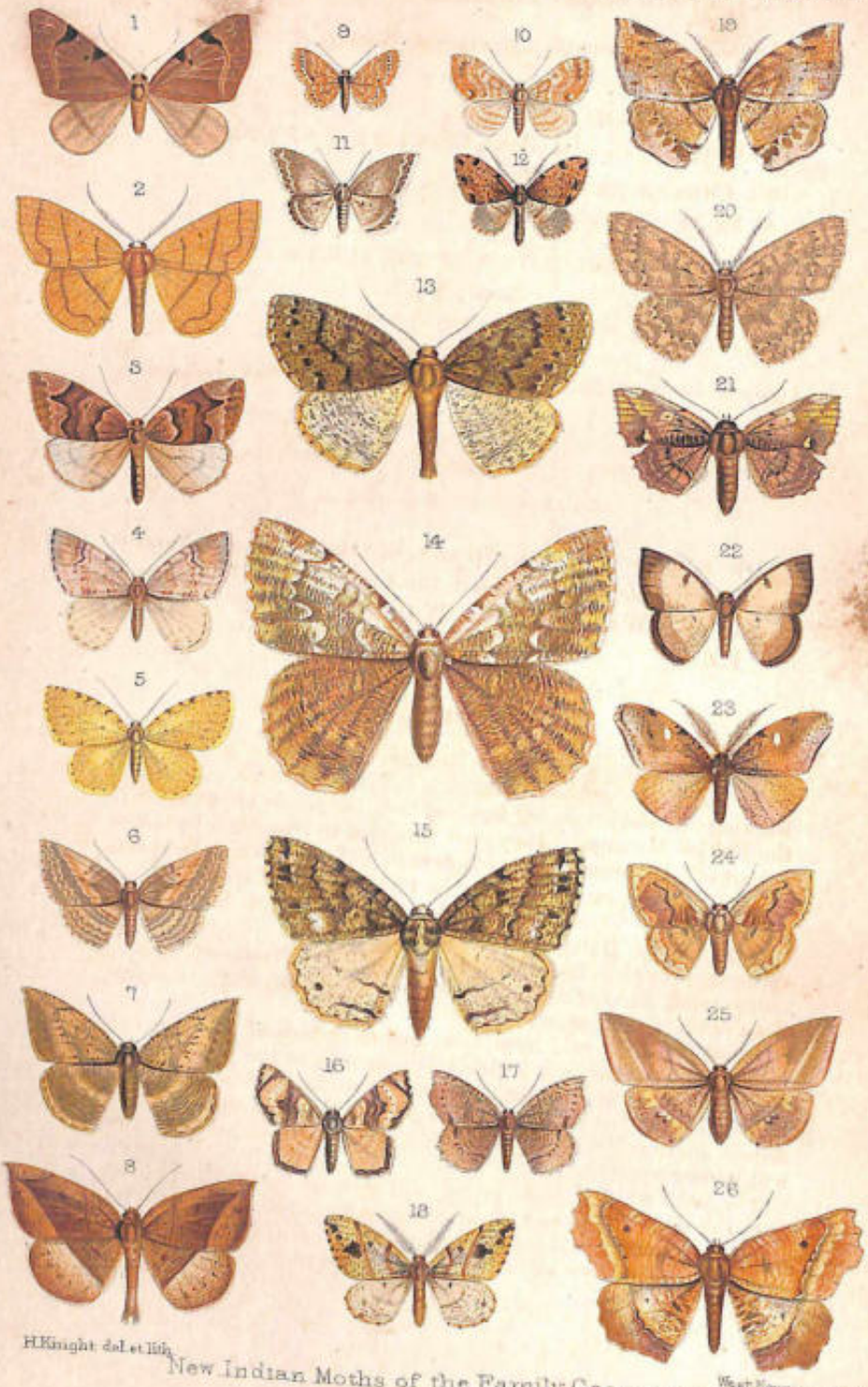
New Indian Moths of the Family Geometridæ.



H.Knight del. et lith.

West, Newman. chromo.

New Indian Moths of the Family Geometridæ.



H.Knight del.et lith.

New Indian Moths of the Family Geometridæ.

West, Newman & Co. imp.

18. CAVIA (KERODON) BOLIVIENSIS, Waterh. (?).

a. Ad. sk.

19. DIDELPHYS MARSUPIALIS, L.

a. Imm. sk. ♀. La Gloria, Chanchamayo. 7/8/90.

20. CHIRONECTES MINIMUS, Zimm.

a. Yg. al. Chanchamayo.

EXPLANATION OF THE PLATES.

PLATE XXVIII.

Ichthyomys stolzmanni, natural size.

PLATE XXIX.

Figs. 1–4. *Ichthyomys stolzmanni*. Skull—upper, lateral, palatal, and anterior aspects.

5. —— ——. Sole of hind foot.

6. —— ——. Cæcum, natural size.

7–9. *Artibeus glaucus*. Skull—palatal, anterior, and lateral aspects; enlarged.

10. *Nyctinomus kalinowskii*. Head, enlarged.

3. On new Genera and Species of Moths of the Family *Geometridæ* from India, in the Collection of H. J. Elwes. By W. WARREN, M.A. With Notes by H. J. ELWES, F.Z.S.

[Received April 18, 1893.]

(Plates XXX.–XXXII.)

[The following descriptions have been written by Mr. Warren, from specimens selected from my Collection, whilst engaged in working out and arranging the insects of the family Geometridæ in the British Museum. They were intended to have been published as part of a paper on the Lepidoptera of Sikkim, of which two parts have already appeared; but as the total number of species is very large, and the whole of the Indian Heterocera are in course of revision by Mr. Hampson, and as many of these species of which specimens were collected by me in 1886 have remained so long undescribed, I have thought it best not to delay any longer descriptions of the new species.

I may add that, as I have examined the whole of the large collection formed by the late Mr. Atkinson now in the possession of Dr. Staudinger, and as Mr. Warren has studied the whole of the Geometridæ in the collection of te British Museum and of Mr. F. Moore, there is good reason to believe that few or no synonyms will be now created.

The notes which I have added will give, as far as possible, the localities where these species have been taken, though of many of them, for which I am indebted to the late Otto Möller, Mr. Knyvett, and Mr. Doherty, we know but little at present.

I would refer those who wish to know more of the physical features of the localities in question to my Catalogue of the Butterflies of Sikkim, in the Transactions of the Entomological Society for 1888, and to my notes on Mr. Doherty's collections in the Society's 'Proceedings' for 1892.—*H. J. E.*]

Subfam. Œnochrominæ.

Xenozancla, gen. nov.

Fore wings with costa gradually curved from base to apex, but somewhat flattened just before the middle; apex produced, blunt; hind margin strongly indented below apex, forming a prominent blunt projection at the end of the 2nd and 3rd median nervules, thence running very obliquely inwards; anal angle rather prominently defined. Hind wings with a small point at end of 2nd subcostal nervule, and a small indentation below it opposite the cell; anal angle squared. Antennæ simple, closely laminated, rather flattened; palpi short, smooth, horizontally porrect, 3rd joint not distinctly separable; tongue invisible (? absent); legs short, stout, hind tibiæ rather thick; spurs excessively short. Abdomen with slight, oblique dorsal tufts. Neuration:—Fore wings: 1st median nervule at $\frac{3}{4}$, 2nd and 3rd close together from lower end of cell; lower radial from a little above the centre of the discocellular; upper radial from upper end of cell; 5 subcostals on a common stem; the 5th starting halfway between end of cell and apex, and running into hind margin below apex; the 4th into costa before apex; 1st, 2nd, and 3rd at equal distances one after the other. Hind wing: costal approximated to subcostal briefly near base; 2 subcostals from upper end of cell; 1st median nervule shortly before end of cell; 2nd just before end; 3rd from lower angle; radial from a little above the centre of the discocellular.

Type, *Xenozancla versicolor*, sp. nov.

The radials both in fore and hind wings are situated much as in the *Geometrinæ* proper, rising above the centre of the discocellular, and not running parallel to the nervules on either side; but the genus appears to me referable with more propriety to the *Œnochrominæ*, in which subfamily are other instances of similar position of the radial of the hind wings.

Xenozancla versicolor, sp. n. (Plate XXXII. fig. 17.)

♂. Fore wings, towards the base and along the costa, olive-ochreous, thickly dusted with transverse fuscous dots and strigæ; rest of the wing dull mouse-colour, with few irrorations; 1st line black, very indistinct, at $\frac{1}{3}$; basal area inside of it, more yellowish, less dusted with darker, like the apical costal space; 2nd line represented on costa and inner margin by a black line, curved outward, and between these by 4 black spots on the veins. Hind wings with the 2nd line exactly similar; the whole basal $\frac{2}{3}$ mouse-colour dappled with fuscous and reddish brown; the outer third less irrorated, and yellowish olive towards the inner angle; fringes

(damaged) mouse-colour with a pink tinge; face deep red-brown; head clear, pale ochreous; thorax and abdomen olive-ochreous mixed with darker; abdominal crests tinged with red. Underside dull mouse-colour, dusted with grey, and without distinct markings.

Expanse of wings 24 millim.

Hab. Naga Hills.

Subfam. ORTHOSTIXINÆ.

NAXA ORTHOSTIGIALIS, sp. n.

Fore wings dull whitish, semitransparent, with all the veins blackish, and the costa smoky grey; basal transverse line marked by 3 black, lengthened spots lying on the subcostal, median, and submedian veins; exterior and subterminal lines denoted by similar spots on all the veins; a larger dark oblong cell-spot, and dots on the veins below it. Hind wings like fore wings, but without the basal dots. Underside, with cell-spots and two outer rows of spots only distinct, but these more so than above.

Expanse of wings, ♀ 52 millim., ♂ 48 millim.

Hab. Sikkim; Bhotan.

[Taken by me at Darjiling in July.—*H. J. E.*]

PSILONAXA, gen. nov.

Orthostixis, Motsch. Bull. Mosc. 1866, p. 196.

Orthostixis, S. & W. Cat. 2241.

Zerene, de l'Orza, Cat. Lép. Jap. p. 48, no. 113 (1869).

The species of this genus agree with *Naxa*, Wlk., in the shape of the wings, the scaling, and all points of structure except the antennæ, and herein they agree with *Orthostixis*, Hüb., which likewise has simple antennæ in both sexes.

Type, *P. taicoumaria*, de l'Orza (*Zerene*).

PSILONAXA OBLITERATA, sp. n. (Plate XXXI. fig. 10.)

♀. Like *P. taicoumaria*, de l'Orza, but smaller and feebler; all the spots reduced to mere dark dots; the two lower ones of the basal row nearly absent.

Hab. Bhotan; Naga Hills.

Two worn specimens in Mr. Moore's collection marked *linteata*, M., may be the same; they are ♂ ♀ from Darjiling.

[This was taken at about 7000 feet by Doherty near Mao, Manipur, in August.—*H. J. E.*].

CRYPTOLOBA, gen. nov.

Larentia, Moore, P. Z. S. 1867, p. 654.

Lygranoa, Butler, Ann. & Mag. Nat. Hist. ser. 5. vi. p. 228 (1880).

Fore wings with costa convex, hind margin obliquely curved; hind wings rounded; both wings elongate; hind wing in ♂ with a peculiar chitinous lobe attached to the base of the abdominal margin. Antennæ rather long, strongly pectinated in the ♂,

shortly, but decidedly pectinated in the ♀ ; palpi long, porrected, both second and terminal joints ending in a rostriform point ; legs long.

Type, *Cryptoloba ærata*, Moore (*Larentia*).

CRYPTOLOBA MINOR, sp. n.

♂ ♀. Resembles *C. ærata*, Moore, in general appearance, but *decidedly smaller* ; the pale gilded tints of *ærata* are much less prominent ; the broad blackish external shade is entire, and not interrupted by any pale subcostal streak, such as in *ærata* runs into the apex ; the cell-dot, which in *ærata* is small and punctiform, is here enlarged and diffuse ; the pale subterminal line consists of yellowish lunular markings, not confluent towards the anal angle, nor curved outwards as in *ærata*.

Hab. Sikkim.

This is altogether a duller and more insignificant-looking species than *ærata*, Moore, though undoubtedly closely allied.

[I hardly think that when a series of *C. ærata* is examined, this species can be distinguished. I have taken it at from 7000 to 10,000 feet in Sikkim.—*H. J. E.*]

CRYPTOLOBA SUBUSTA, sp. n.

♂. Fore wings pale grey with a slight olive tinge, glossy, without strigæ ; basal ⅓ slightly suffused with fulvous, more so externally, and bounded by the first line, which is represented by small black dots on the veins ; 2nd line similar, and followed by a distinct olive-tawny fascia ; both lines, as well as the fasciæ which accompany them, are bluntly angulated below the costa ; a dark blotch with a paler centre in the middle of the hind margin, between the outer fascia and the fringes, which are grey ; a small dark discal dot. Hind wings rather paler grey, with a dark discal dot and a faint, irregular submarginal darker fascia. Face olive-grey ; thorax darker ; abdomen cinereous.

Underside : fore wings dull cinereous ; hind wings paler.

Expanse of wings 20 millim.

Hab. British Bhotan.

[I took this in very dense forest at about 9000 feet on the Rishilah, on Aug. 8th. It is a very distinct species.—*H. J. E.*]

CRYPTOLOBA TRINOTATA, sp. n. (Plate XXXII. fig. 12.)

♂. Fore wing with an ochreous-olive tinge, irregularly dusted with short black strigæ ; the 2 cross lines broad, fulvous, indefinite ; the first at ⅓, vertically sinuous ; the 2nd at ⅔, curved outwards below costa, then running parallel to hind margin ; each starts from a black blotch on the costa, the exterior the larger ; beyond this, a third small costal black blotch ; the inner line is slightly edged externally, and the outer line internally with black dots ; basal area more or less suffused with fulvous ; on the hind margin just below the apex is a small blackish spot, and a longer one at

the anal angle; fringe iron-grey chequered with pale olive. Hind wings dull whitish, speckled with grey at the base; the outer half, the inner margin, and a large discal spot dark grey. Head and thorax olive-ochreous; abdomen grey. Underside pale straw-colour, which in the fore wing is almost wholly suffused with iron-grey; patches along the costa, hind margin, and inner margin alone remaining pale. The hind wings have a broad dark marginal band and discal spot.

Expanse of wings 22 millim.

Hab. Sikkim.

[The type, which is unique, was taken by Möller's native collectors at about 7000 feet.—*H. J. E.*]

ISOLOBA, gen. nov.

Like *Cryptoloba*, Warr., but with the ♀ antennæ not plumose, but moniliform; the antennæ shorter, with finer and longer lateral branches; wings glossy, with two straight brown transverse lines, and without the silvery metallic spots and streaks that characterize *Cryptoloba*.

Type, *Isoloba bifasciata*, sp. n.

ISOLOBA BIFASCIATA, sp. n. (Plate XXXII. fig. 18.)

♂ ♀. Fore wings glossy straw-colour, finely and irregularly dusted with black atoms; 1st and 2nd lines at $\frac{1}{3}$ and $\frac{2}{3}$ respectively, thick, brown, nearly straight, being slightly recurved only towards the costa; the 1st immediately followed, in the centre of the wing, by a thicker cluster of black atoms; the 2nd by a still larger blackish blotch; 3 small oblique black dashes on the costa before apex, and 2 black flecks, in an oblique line, from the apex to the black blotch beyond the 2nd line; fringes straw-colour, broadly chequered with black at the ends of all the veins. Hind wings duller straw-colour, scarcely dusted with darker, with the dark chequering of the fringes much narrower and less conspicuous. Head, palpi, and thorax the same colour as the brown transverse lines; the abdomen mottled straw-colour and brown. Underside of both wings bright straw, mottled with dark atoms, and with a diffuse dark grey shade beyond each of the 2 lines on the front wing; the black chequering of the fringes visible also beneath.

Expanse of wings 26 millim.

Hab. Sikkim.

[Not rare from Tonglo to Sundukpho on the Nepal frontier, 10,000–12,000 feet.—*H. J. E.*]

LOBOGONIA, gen. nov.

Closely related to *Cryptoloba* and *Isoloba*, with which it agrees in neuration and scaling, but characterized by the angulation in the hind margin of both wings.

Type, *Lobogonia ambusta*, sp. n.

Lobogonia ambusta, sp. n. (Plate XXXI. fig. 21.)

♂. Fore wings pale yellowish ochreous, with a very few scattered fuscous strigæ; 2 transverse, straight, olive-brown lines, at $\frac{1}{3}$ and $\frac{2}{3}$ respectively, each starting from a darker costal blotch; costa itself finely speckled with black; subterminal line indicated by a small blackish costal spot, another on the inner margin, and a third opposite the cell; an oblong brownish blotch almost touching the 2nd line in the middle, just beyond it; fringes more reddish, edged with black from apex to elbow, and with 2 black spots below it. Hind wings like fore wings, but with a single dark line just in the centre, and the fringes less touched with black. Head, thorax, and abdomen ochreous; antennæ the same, but much dusted with darker. Underside fulvous-ochreous, much irrorated with transverse grey strigæ, which are massed into a blotch towards the base of the fore wings; both wings with distinct dark cell-spot, and central broad dark line; inner margin of fore wings clear ochreous, quite without markings.

Expanse of wings 30 millim.

Hab. Khasia Hills.

[Taken at light by me at about 5000 feet in Sept.—*H. J. E.*]

Myostoma, gen. nov.

Fore wings with costa nearly straight, slightly curved only at base and before apex; apex produced, blunt; hind margin subfalcate below apex, with an elbow in the middle; the anal angle rather square; hind wings rather narrow, pear-shaped; antennæ ♀ simple, ♂ faintly pubescent; forehead rounded, smooth; palpi very short indeed, hardly perceptible; tongue weak. Neuration:—Fore wing: 1st median nervule at $\frac{2}{3}$; 2nd and 3rd from the end of cell; lower radial from the centre of the transverse vein; upper from the upper angle of cell; 1st subcostal free; 2nd and 3rd out of 4th shortly before apex, 5th out of 4th at $\frac{1}{3}$ from cell. Hind wings, ♀: costal and subcostal nervures strongly convex towards each other, approaching, but not touching, about middle of cell; 1st subcostal nervule rising just *before* end of cell; discocellular bluntly angulated, radial from the angulation; 1st median nervule at $\frac{2}{3}$, 2nd and 3rd from a point at lower end of cell.

Hind wings, ♂: with the costal and subcostal running more or less parallel to middle of cell; subcostal nervules from end of cell; discocellular angulated; the lower end of cell produced and rounded; 1st median nervule at $\frac{2}{3}$, 2nd and 3rd near each other from the rounded extremity of cell; radial at the same distance just beyond the 3rd.

Type, *M. straminea*.

This difference in the neuration in the two sexes is repeated in the next genus, where the abnormality of neuration in the ♂ is still more noticeable. In *Myostoma* the wings are longer and narrower in proportion in the ♂ than in the ♀. I have described

the ♂ separately, as it differs somewhat from the ♀, but I think it is safely referable here.

MYOSTOMA STRAMINEA, sp. n.

♂. Fore wings very pale straw-colour, shaded with pale olive-fulvous; the lines darker; 1st line at $\frac{1}{3}$ of the costa, runs outwards and is angulated below the costa, then runs obliquely inwards to the inner margin at $\frac{1}{4}$; exterior line at $\frac{3}{5}$, similar to the inner line; space beyond to hind margin darker than the rest of the wing; a dark oblique streak from apex to the angulation of the outer line; a slightly darker shade on the costa before apex; both transverse lines more strongly marked at their origin on costa; an irregular indistinct pale submarginal fascia; base of fringes brown; fringes themselves pale straw; base of wing and costal region shaded with fulvous. Hind wings pale straw, with cell-spot distinct and 2 very indistinct darker bands towards hind margin; underside the same, with the lines more distinct. Head, thorax, and abdomen straw dusted with fulvous.

Expanse of wings 26 millim.

♀. Wings dull straw-colour, finely dusted with fuscous; cross lines very indistinct, starting from dark brown costal flecks, and only visible at the veins; 1st irregularly vertical at $\frac{1}{3}$, 2nd at $\frac{2}{3}$, strongly angulated below the costa and then parallel to the hind margin; an indistinct dark costal spot before apex, and a stronger one on the hind margin below the apex; an indefinite dark discal spot; hind wings with the discal spot and a narrow submarginal band darker. Head, thorax, and abdomen dark greyish fulvous; underside dull ochreous, darker along costa of fore wing; discal spot of hind wing and subapical spot on fore wing both conspicuous.

Expanse of wings 24 millim.

Hab. Sikkim.

[Taken at light by me on Aug. 4th at Darjiling.—*H. J. E.*]

DYSETHIA, gen. nov.

Fore wings triangular; costa straight, convex just before apex, and faintly concave in the middle; hind margin obliquely curved, slightly bowed above the anal angle, which is distinctly marked; apex of the ♂ somewhat falcate. Hind wings of ♀ $\frac{2}{3}$ as wide as fore wings, with the hind margin rounded; of ♂ not more than half as broad as fore wings, with the hind margin straight. Antennæ rather thick, simple in ♀, rather strongly ciliated in the ♂; palpi short, horizontally porrect, laxly scaled, the 3rd joint very minute; tongue present, but weak. Hind tibiæ of ♂ not thickened, with two pairs of spurs. Neuration:—Fore wings: cell half the length of the wing; discocellular vertical; 1st median nervule from $\frac{1}{2}$ of the cell; 2nd and 3rd together from the lower end, the 3rd straight in the ♂, somewhat arched in the ♀; lower radial from the middle of the discocellular; upper radial from

upper angle of cell; 5th subcostal nervule close to the angle, curved upwards at first, so as nearly to touch the common stem of the other 4, then running nearly parallel to upper radial into the hind margin below the apex; common stem of the rest rising at $\frac{1}{2}$ of cell; 1st leaving it just beyond the point where the 5th is approximated to it; 2nd and 3rd both shortly before apex; 4th running into apex itself. Hind wings, ♀: with the discocellular vertical, costal and subcostal approximating at a point not far from base, the subcostal branches forking as usual from upper angle of cell, the lower subcostal reaching the hind margin at $\frac{1}{3}$ from interior angle; 1st median nervule only a little before lower angle of cell, 2nd and 3rd together from the angle; radial from the centre of the discocellular. ♂: With the cell much broadened, and somewhat distorted; 2nd subcostal curving strongly downwards away from the 1st, and reaching the hind margin well below the centre; discocellular running obliquely inwards from the curvature of the 2nd subcostal; 1st median just before, 2nd and 3rd from the lower end of cell; radial just above the origin of the last 2; inner margin fringed thickly with long hairs.

Type, *Dysethia bicommata*, sp. n.

The difference in the neuration of the hind wings of the sexes is somewhat analogous to that which occurs in the Larentiad genera *Anaitis*, &c.

DYSETHIA BICOMMATA, sp. n. (Plate XXXII. fig. 1.)

♂ ♀. Fore wings deep fuscous-brown, sprinkled, especially towards costa and base, with pale lilac scales; lines blackish:—1st at $\frac{1}{4}$ runs obliquely outwards, and reaches the inner margin not much before its centre, forming a strongly marked angulation on the submedian; 2nd a little before the middle, forms an irregularly triangular mark on costa only, nearly touching the large oval blackish discal spot; 3rd at $\frac{3}{4}$ forms a curved, blackish, outwardly pointed costal spot, then a sinuous, pale-edged line to near the anal angle; submarginal line denticulate, formed of pale lilac scales, most distinct towards the costa, where it is preceded by a dark costal patch; fringe fuscous-brown; basal line of fringes and all the nervules beyond the middle of the wing yellowish. Hind wings of ♀ as the fore wings, with a dark brown submarginal curved line; of ♂ dull greyish ochreous, with a diffuse dark shade in place of the line which is visible in the ♀. Head, thorax, and abdomen concolorous with ground-colour of fore wings. Underside dull fuscous, with the exterior line and discal spots only darker; in the ♂, the underside is rather strongly tinged with tawny, especially along the costa; the ♀, if fresh, would probably show the same tint; in the ♂, owing to the displacement of the radial, the dark discal spot, which is very diffuse, is situate almost at the lower angle of the cell.

Expanse of wings, ♀ 38 millim., ♂ 34 millim.

Hab. Sikkim.

It is worthy of observation that the pale lilac scales, which are

sparsely scattered over the upper wings, soon wear off, so that the insect assumes a dingy appearance.

[Specimens from the Naga Hills taken by Doherty at 5000–7000 feet agree with those described.—*H. J. E.*]

Subfam. Pseudoterpninæ.

Dindica mölleri, sp. n.

♂ ♀. Nearly allied to *D. crocina*, Butler; of the same size, but differing in the following respects:—The fore wings are much darker, being largely suffused with brown; the apical white patch is absent; the submarginal line is represented by a series of whitish spots. The hind wings have the abdominal half smoky green, which tint also extends over the thorax and abdomen; the hind margin of the hind wings is broadly blackish; and there are 3 distinct rounded black blotches besides the central one. Underside with all the black markings more prominent. Possibly a local form of *D. crocina*, Butler.

[I have a long series of this species taken at from 5500 to 8000 feet in Sikkim, where it seems to be much commoner than *D. crocina*, of which I have only two specimens taken by natives. It appears quite distinct.—*H. J. E.*]

Terpna opalina, sp. n. (Plate XXXII. fig. 14.)

♀. Fore wing pale olive-green, thickly sprinkled with transverse purple strigæ, except in the subcostal region, where the ground-colour becomes pale greenish white; the two transverse lines purplish, the first forming two blunt teeth, and broadly edged internally with greenish white; the whole basal space nearly filled up with the same tint, except below the median vein, where there is a patch of mixed olive and purplish scales; 2nd line strongly dentate, describing an oblique outward curve below the costa, then a vertical curve beyond the cell-space, and approaching the 1st line on the submedian fold, where it is followed by a small, pure, pale greenish-white spot; a large dull purplish-grey, kidney-shaped spot at the end of the cell; the costal edge of the space between the two lines, and the whole width of the band below the median vein thickly strewn with purple strigæ; costa between the 2nd line and apex with a small patch of purplish and olive scales, surrounded with pale greenish white; rest of the submarginal space thickly strewn with the purplish strigæ, which towards the edge itself are clustered along the veins; submarginal line faintly indicated in greenish white. Hind wings entirely dull olive-green, thickly beset with purplish strigæ, with an oval, paler-centred purplish cell-spot; fringes mottled, greenish white and olive, with a fine dark-purple basal line. Head, face, and thorax pale greenish white; abdomen mottled with darker. Underside pale opal, tinged at the extreme base with yellow and along the disk with purple; the cell-spots purple and distinct.

Expanse of wings 50 millim.

[I have four specimens of this distinct species taken by native collectors on the Nepal frontier at 7000–8000 feet.—*H. J. E.*]

PERISSOLOPHIA, gen. nov.

Akin to *Terpna*, H.-S., in having the abdominal segments armed with erect tufts of hair, and with one dense and extraordinarily long one behind the thorax; differing from all allied genera in the shape of the wings; fore wings longer in proportion, not so triangular, with the hind margin curved and denticulated; hind wings not prolonged in the direction of the body, with rounded and denticulate hind margin; densely clothed with long hairs towards the base. Antennæ strongly pectinated nearly to the tip, the pectinations being longer than in *Terpna*; palpi with 2nd joint hairy beneath; 3rd joint, bluntly rounded, porrected in front; abdomen beneath and all femora hairy.

Type, *P. subrosea*, sp. n.

PERISSOLOPHIA SUBROSEA, sp. n.

♂. Fore wings dull olive-green, suffused with pink and speckled with purplish atoms; lines indistinct, purplish; 1st oblique, irregularly angular; 2nd running obliquely outwards towards the centre of the hind margin, then irregularly dentate, parallel to it; submarginal line faintly indicated by three white arrow-heads below the costa; an oblique blackish dash at the end of the cell. Hind wing towards the base pinkish ochreous; costal half wholly pink; hind margin greenish, both flecked with purple. Head and thorax dull olive-green, like the fore wing; abdomen more ochreous, like the hind wing. Underside shining ochreous, strongly suffused with pinkish, especially along the costa; abdomen beneath and femora of all the legs beset with thick ochreous hairs.

Expanse of wings 46 millim.

[Several specimens of this very distinct species were taken by native collectors in May and June in the interior of Sikkim.—*H. J. E.*]

ACTENOCHROMA, gen. nov.

Distinguished from *Hypochroma*, Guen., by the simple antennæ of the ♂.

Type, *A. muscicoloraria*, Wlk. (*Hypochroma*).

ACTENOCHROMA FARINOSA, sp. n.

♂. Resembles *A. viridaria*, Moore, but a little larger and longer-winged; dull cinereous green, varied with whitish and pale grey; all the markings much as in *viridaria*, but without the pink spots so conspicuous in that species. Underside with only a very faint indication of a darker submarginal band, but with a distinct, large blackish central spot on each wing.

[A single ♂ specimen taken in Lahoul, North-west Himalayas, at 12,300 feet, on Sept. 9, by Capt. Grahame Young. It seems a distinct species.—*H. J. E.*]

SPHAGNODELA, gen. nov.

Fore wings rather lengthened; the costa gradually curved throughout; hind margin evenly rounded. Hind wings with hind margin rounded, the inner angle rather prominent. Forehead shelving, slightly prominent; vertex with erect hairs; thorax and patagia hairy; abdomen with segmental crests; palpi not long, porrect, ascending, the third joint inconspicuous; tongue present; antennæ of ♂ pectinated, the pectinations short, curved, and directed slightly forward; legs and underside of thorax hairy. Neuration: cell half as long as wings; discocellular angulated; lower end of cell wedge-shaped; 1st submedian at $\frac{2}{3}$, 2nd at $\frac{5}{6}$, 3rd from end of cell; lower radial from above the angulation of discocellular; upper from the upper angle; 3rd, 4th, and 5th subcostals on a common stem; 1st and 2nd the same. Hind wings: costal running near subcostal for a short distance; two subcostals on a short stem; the rest as in fore wings.

Type, *S. lucida*, sp. n.

SPHAGNODELA LUCIDA, sp. n. (Plate XXXII. fig. 13.)

♂. Fore wings bright moss-green, varied with paler yellowish green and thickly dappled with coarse blackish dots; lines blackish, denticulate, first at $\frac{1}{4}$, vertical; second at $\frac{3}{5}$, sinuous, approaching the first line by a sinus above the inner margin; submarginal line composed of a curved series of black spots, each followed by some silvery-white scales; some irregularly scattered white scales also follow the second line, and are dusted over the disc; cell-spot large, dark; fringes olive-green, with black spots at the ends of the veins, and an indistinct dark festooning containing paler scales. Hind wings yellowish ochreous, tinged with green, especially towards the hind margin, and thickly mottled with black transverse strigæ; fringes yellowish green. Palpi dark brownish green; face and vertex pale yellowish green; thorax and abdomen olive-green; antennæ pale yellowish, with a white basal joint. Underside pale ochreous, dappled with fuscous cinereous, the fore wing almost entirely suffused with cinereous except along the hind margin.

Expanse of wings 48 millim.

Hab. Sikkim.

This species differs from *usneata*, Feld., not only in its smaller size but in the absence of any definite lines and markings on the hind wings; it is altogether a much brighter, gayer-looking insect.

[Not an uncommon species on the Nepal frontier of Sikkim, where I have taken it at from 10,000 to 13,000 feet in July.—*H. J. E.*]

Subfam. GEOMETRINÆ.

CHLORODONTOPERA, gen. nov.

Odontoptera, Moore, P. Z. S. 1867, p. 621.

Fore wings elongate; costa nearly straight; apex blunt; hind margin with 2 deep excavations beneath apex, with a prominent

tooth at end of the last subcostal and median nervules; the upper half vertical; the lower very oblique: hind wings broad, strongly crenulate, with a deeper excavation between the last subcostal and last median nervules opposite the cell: palpi porrect, extending beyond face; antennæ of ♂ pectinated; hind tibiæ of ♂ rather swollen, with 4 spurs.

Type, *C. chalybeata* (*Odontoptera*), Moore.

As the hind wings possess a distinct radial, this genus must be transferred to the Geometrinæ.

CHLORODONTOPERA ÆRUGINATA, sp. n.

♂. Fore wings olive-green, with very indistinct markings, which consist of a rusty discal spot and 2 transverse lines, indicated by a curved series of whitish spots; the first curved at $\frac{1}{3}$, the second sinuous, from $\frac{5}{6}$ of the costa to $\frac{2}{3}$ of the inner margin; the first is edged outwardly and the second internally by a very faint rusty shade; fringes dull rusty; hind wings the same; head, thorax, and abdomen all dull olive-green. Underside much brighter olive-green, tinged with rusty yellow; the 2 lines and the discal spot being rust-red, and the costa for $\frac{1}{3}$ from the base broadly dull red; fringes brown-black.

Expanse of wings 28 millim.

Hab. Naga Hills.

Much smaller than, and different of aspect from, the typical species, but structurally congeneric.

[Four males, which agree perfectly, were taken by Doherty at 5000 to 7000 feet in the Naga Hills.—*H. J. E.*]

GELASMA, gen. nov.

Fore wing with the costa curved and short in proportion to the breadth of the wing; apex distinct, but not aculeate; hind margin curved. Hind wings with blunt and short tooth, the hind margin on each side of it curved. Antennæ of ♂ with short pectinations, which only extend to $\frac{1}{2}$ of the length of the shaft; hind tibiæ thickened, with 4 short spurs.

Type, *G. thetydaria* (*Iodis*), Guen.

GELASMA CONCOLOR, sp. n.

♀. Fore wings dull grass-green; the costa finely dark purple, minutely spotted with ochreous; a fine dark line of the same tint along the base of the fringes, interrupted by a very minute pale dot at end of each vein; a distinct and rather large black discal dot; the usual lines paler; the first indistinct, denoted by pale dots on the veins; the second, parallel to the hind margin, is represented by linear dark dots on the veins, tipped externally with white, the white spot on the inner margin being much larger and more conspicuous than the rest. Hind wings like fore wings; fringes of both wings concolorous. Head and thorax deep grass-green; abdomen above olive-green; antennæ and fillet distinctly pale

ochreous. Underside pale bluish white, with the discal dots visible; costa and basal fringe-line distinct, as on the upperside.

Expanse of wings 26 millim.

Hab. Sikkim.

GELASMA GRISEOVIRIDIS, sp. n. (Plate XXXI. fig. 6.)

♂. Fore wings dull sea-green, tinged with grey, with two whitish undulating lines, the first at $\frac{1}{4}$, oblique outwardly; the second at $\frac{3}{4}$, parallel to the hind margin; costa faintly and minutely speckled with yellow and purple; hind wings with the exterior line only; both wings with a darker green linear cell-spot: head and thorax green; abdomen ochreous (? faded). Underside pale silvery green.

Expanse of wings 24 millim.

Hab. Naga Hills.

[Taken by Doherty at 5000–7000 feet.—*H. J. E.*]

HEMITHEA RUBRIPICTA, sp. n.

♂. Fore wings pale yellowish green, most probably deeper green when fresh; costa brick-red, dotted with black; discal spot large, black; 1st line indistinct, partly represented by red spots on the veins; 2nd line, parallel to hind margin, represented by linear red spots on the veins, that on the inner margin swelling out into a more distinct spot. Hind wings the same; fringes of both wings concolorous, with no darker basal line. Vertex and thorax concolorous with ground-colour of wings; abdomen brown-red, with the 2 antepenultimate segments of the wing colour; face, palpi, and antennæ brick-red. Underside pale yellowish, rather glossy, with the costa reddish; discal dot of the fore wing alone visible; legs beneath washed with reddish.

Hab. Sikkim. Also in Mr. Moore's Collection unnamed.

HEMITHEA NIGROPUNCTATA, sp. n. (Plate XXXI. fig. 4.)

♂: Wings pale grass-green, thinly scaled, with two whitish lines, the exterior the more distinct and edged internally with dark green; a small *black* cell-spot in each wing; costa of fore wing ochreous, with dark dustings. Underside pale whitish green, without any markings.

Expanse of wings 30 millim.

Hab. East Pegu. [Taken in spring by Doherty.—*H. J. E.*]

HEMISTOLA, gen. nov.

Fore wings with costa weak and gradually curved; apex blunt; hind margin slightly oblique, hardly convex; anal angle squared. Hind wings kite-shaped, with a decided but not acute tooth in the centre of hind margin. Palpi short, ascending obliquely in front of forehead, which is slightly prominent; antennæ of ♂ distantly pectinated, the pectinations themselves curved, beginning and ending short; the apex filiform; hind tibiæ slightly thickened, with 4 short spurs; hind tarsi abbreviated; discocellular strongly

angulated, especially in fore wings, the radial starting well above the angulation; in the hind wings the 2 subcostal nervules and the last 2 median are shortly stalked. Scaling loose and thin, so that the wings appear semidiaphanous.

Type, *Hemistola rubrimargo*, sp. nov.

HEMISTOLA RUBRIMARGO, sp. n. (Plate XXXI. fig. 3.)

♂. Fore wings pale bluish green, with paler, somewhat ochreous costa, spotted with reddish, the extreme edge red; fringes white, with a distinct red basal line (entirely absent in 1 example), which is interrupted by a white dot at end of each vein, and with their apices reddish; transverse lines white, evenly denticulated, approaching each other on the inner margin. Hind wings like fore wings, but with the first line hardly expressed. Head, thorax, antennæ, abdomen, and legs dull ochreous (perhaps more bluish when fresh); middle segments of abdomen reddish above; patagia pale bluish. Underside pale bluish white, with the base of the costa reddish.

Expanse of wings 30 millim.

Hab. Sikkim.

A specimen in the Brit. Mus. Collection from Darjiling.

[Several specimens of this very pretty distinct species were taken by me on Tonglo at 10,000 feet in July.—*H. J. E.*]

MICROLOXIA, gen. nov.

Fore wings triangular; costa nearly straight; apex rather prominent, but blunt; hind margin well rounded, not very oblique. Hind wings with hind margin rounded. Forehead slightly prominent. Palpi short, porrect. Antennæ of ♀ subdentate; of ♂ pectinated for $\frac{3}{4}$ of the length. Neuration normal.

Type, *M. herbaria*, Hübn.

The genus runs parallel to *Nemoria*, but is distinguished by the pectinated antennæ of the male.

MICROLOXIA EFFORMATA. (Plate XXXI. fig. 2.)

♂. Fore wings pale apple-green, with a broadish white oblique streak from $\frac{3}{4}$ of the inner margin to $\frac{1}{5}$ of the costa; costa and all the veins picked out with white. Hind wings the same, with a white curved submarginal fascia. Head, thorax, and abdomen green. Underside duller paler green, with the veins whitish; the white streaks of the upperside only showing through; base of the costa blackish.

Expanse of wings 26 millim.

Hab. Sikkim.

This species may be distinguished at once by the obtusely produced inner angle of the hind wings.

COMOSTOLA CÆRULEA, sp. n. (Plate XXXI. fig. 1.)

♂. Fore wings very pale azure; costa yellow speckled with purple;

fringes and extreme hind margin yellow, preceded by a purple festoon, which runs in a short distance along the inner margin; at ¾ of the costa a funnel-shaped purple marking obliquely curved outwards to the radial, and reappearing on the inner margin before anal angle as a small cone-shaped spot. Hind wings similar; but without any costal markings. Head and palpi reddish; antennæ yellowish, touched with red; abdomen ochreous, with red dorsal markings; thorax azure. Underside paler azure, with costa of fore wings and fringes yellowish.

Expanse of wings 26 millim.

Hab. Sikkim.

[I have only seen two males of this very distinct species, both taken by natives.—*H. J. E.*]

Uliocnemis, gen. nov.

Fore wings broad, triangular; costa gradually arched throughout; apex blunt; hind margin rounded, hardly oblique; anal angle well marked. Hind wings broad, with the interior angle rounded and the anal angle produced and square; hind margin variously rounded, sometimes cut off squarely. Palpi porrect, in ♂ quite short, in ♀ much longer. Antennæ of ♂ with long pectinations, which are themselves pubescent; in ♀ also pectinated, but much less strongly than in ♂. Fore tibiæ of ♂ with a tuft of hair underneath. Neuration normal. Scaling delicate, fine, and silky.

Type, *Uliocnemis cassidara*, Guen.

The tuft of hairs on the fore tibiæ of the male is often difficult to be made out, and is liable to be worn off.

Uliocnemis albimarginata, sp. n.

♀. Wings pale grass-green; fore wings with two white vertical transverse lines; the first slightly curved outwards at ¼; the second at ¾, sinuous from costa to the 3rd median nervule, then straight towards the anal angle, before reaching which it is diverted rectangularly inwards, including at the angle a small brown patch; an indistinct, irregularly sinuous, submarginal whitish line; the green space between the exterior and the submarginal line is interrupted below the costa by a suffused white patch; nervules towards the hind margin whitish; fringes whitish green, a minute black-brown dot at their base between the nervules; 2 larger ones at the anal angle beyond the brown patch; discal dot small, brown. Hind wings with the discal marking linear, brown; exterior line indistinctly white, starts from the costa level with the extremity of the exterior line of the fore wing, runs vertically to the lower subcostal, along which it goes nearly to the hind margin, then curves along the hind margin, widening in its course to above the anal angle; space between this line and the hind margin filled up with black-brown from the costa to the radial; thence white, more or less tinged with green in the middle. Head, thorax, and abdomen (probably) green; underside of abdomen white. Underside

of wings whitish green, with the dark discal spots and apical blotches showing through.

Expanse of wings 32 millim.

Hab. Sikkim.

Although the example is a ♀, there is no doubt about its being an *Uliocnemis*, from the great similarity to others of the genus, especially to a yet undescribed species from Japan in the B. M. Collection.

[Taken in June by O. Möller.—*H. J. E.*]

ULIOCNEMIS ALBIRADIATA, sp. n.

♀. Wings grass-green, with some very faint, paler, transverse undulations; costa broadly white, becoming greener at the base; a white basal blotch; first line at $\frac{1}{6}$, obliquely curved, delicate; the discocellular marked by a similar white curve, convex to the 1st line; all the veins neatly white; the green ground-colour is concisely bordered at $\frac{2}{3}$ by a broad whitish-ochreous patch, which occupies the rest of the wing except the apical third, where the green ground-colour reappears, traversed by the white veins, and transversely by an obliquely curved white line, starting from the costa before the apex, and disappearing where it joins the pale patch above the centre of the wing; fringes whitish, with darker dividing lines; some very minute dark dots between the veins below the apex, one larger in the middle of the hind margin, and a black line at the anal angle, before which there is a slight fuscous discoloration of the pale ochreous blotch. Hind wings like fore wings, but with the ground-colour restricted to a rhomboidal basal area, the ochreous pale patch running up along both the costa and abdominal margins; towards the 2 angles the fuscous discoloration of the fore wings is repeated to a still greater extent; 2 or 3 large dark dots before the fringe at the inner angle. Head, thorax, and abdomen green, underside of abdomen white. Underside of wings bluish green towards the base, with a broad white border containing a brown patch at the inner angle of the hind wings, and at the anal angle and in the centre of the hind margin of the fore wings.

Expanse of wings 36 millim.

Hab. Naga Hills.

[A very lovely and distinct species, taken by Doherty at 5000–7000 feet.—*H. J. E.*]

ULIOCNEMIS DELINEATA, sp. n. (Plate XXXI. fig. 14.)

♂ ♀. Fore wings pale yellowish green, covered with fine irregularly undulating yellowish strigæ; the costa broadly pale yellowish to the tip; all the veins yellowish; 1st line straight, oblique, whitish; 2nd line, starting at about $\frac{4}{5}$ of the costa, runs straight towards the anal angle, stopping short and turning abruptly basewards along the 1st median nervule, and then reaching the inner margin before the angle as a vertical broader blotch; discal dot

minute, dark; fringe green, with pale yellowish basal line, and one or two minute dark dots above the anal angle. Hind wings similar, but the second line runs nearer the margin, as in *pictipennis*, Butler, forming a short indentation near the middle, and a deeper, more acute one near the anal angle, which is filled up with pale pink; 2 small black dots at base of fringe above anal angle, and some black scales below the apex. Collar and thorax ochreous like the costa; abdomen discoloured, probably greenish; underside wholly pale.

Expanse of wings 26 millim.

Hab. Sikkim.

[I have only seen specimens from the interior.—*H. J. E.*]

Uliocnemis ? signifera, sp. n. (Plate XXXI. fig. 15.)

♀. Fore wings pale apple-green, finely dappled with whitish; 1st line at $\frac{1}{3}$, sinuous, 2nd line at $\frac{2}{3}$, irregularly sinuous; costa, basal and marginal areas whitish, the latter mixed with green just beyond the 2nd line; along the submedian fold a white bidentate projection runs from the outer white area nearly to touch the basal portion; cell-spot round, blackish; fringes white. Hind wings much more largely green; costa and extreme hind margin white, the former and the apical $\frac{1}{3}$ of the latter suffused with grey; a dark blackish straight dash runs from the costal streak obliquely inwards for $\frac{1}{3}$ the breadth of the wing; fringes of both wings with minute dark dots at base between the veins, and with 2 more distinct just above the anal angle. Face, antennæ, head, thorax, and abdomen all apparently white. Underside of fore wings wholly green except the inner margin, which is white tinged irregularly with fuscous; 2nd line white, slender. Hind wings pure shining white, with a fine sinuous green line at $\frac{2}{3}$ and a dark fuscous cell-spot; inner angle likewise fuscous-tinged. Legs and underside of abdomen white; fore legs (apparently) tinged with fuscous.

Expanse of wings 36 millim.

Hab. Momeit, Burmah.

[Taken by Doherty in June 1890.—*H. J. E.*]

Berta albiplaga, sp. n. (Plate XXXI. fig. 5.)

♀. Wings dull olive-green; first line at $\frac{1}{3}$, represented by whitish dots on the veins, connected by a very fine white line; second line at $\frac{2}{3}$, starts from a white costal spot, forms 2 regular bilobed outward sinuses, and one between them inward, and reaches the inner margin not far from the first line; at each nervule the line forms a white spot; subterminal line composed of a series of white spots; a larger white spot on costa at the middle above the white and diffuse cell-spot; fringe green, with white dots along the base. Hind wings like fore wings, but with the base and a broad central band white; space between the white band and base wholly green; marginal space green, with a repetition of the two outside lines of

the fore wings. Head, thorax, and abdomen concolorous with ground-colour. Underside whitish, without any markings.

Expanse of wings 22 millim.

Hab. Naga Hills.

[Taken at about 2000 feet by Doherty in Sept.—*H. J. E.*]

Euchloris (?) ovifera, sp. n.

♀. Wings blue-green; fore wings with costa distinctly yellow; first line represented by 2 oval white spots, one on the median, the other on the submedian; exterior line represented by 6 similar oval white spots, on the 2 radials, the 3 median nervules, and the submedian nervure respectively, the lower 3 running obliquely outward in a straight line, the upper 3 more vertically; a round white cell-spot. Hind wings rather paler than fore wings, with faint indications of the exterior row of pale spots; fringes of both wings whitish yellow. Head, thorax, abdomen, and legs green; antennæ yellowish white; face red. Underside of the fore wings grey on the disk, streaked with green, green wholly only towards apex; hind wings wholly green.

Expanse of wings 26 millim.

Hab. Tonglo, Sikkim.

[Of this very delicate and, when fresh, beautiful species I took several specimens at 10,000 feet in July.—*H. J. E.*]

Dyspteris asiatica, sp. n. (Plate XXXI. fig. 8.)

♂. Fore wings rather dull bluish green, with 3 white oblique lines—the first at $\frac{2}{5}$, curved, and towards the inner margin irregularly sinuous; the second, irregularly dentate, runs obliquely from $\frac{3}{5}$ of the inner margin, where it is approximated to the first line, to the costa just before the apex; the submarginal line is finer, and more regularly dentate, close to the hind margin; a distinct white cell-spot. Hind wings white over the whole costal and basal areas, becoming green only towards the anal angle, where can be discerned the beginnings of 2 white lines corresponding in position and width to the exterior and submarginal of the fore wings; the veins all marked in green; fringe of both wings whitish green. Head and thorax dark blue-green; abdomen paler green. Underside like upper, but duller.

Expanse of wings 30 millim.

Hab. Sikkim.

[I took one on Aug. 4th at light at 7000 feet, and have others from the interior.—*H. J. E.*]

Subfam. Idœinæ.

Problepsis conjunctiva, sp. n.

♂. Fore wings white; ocellus round the outer rim olive-ochreous, spotted with metallic silver; the centre whitish, thickly dusted with reddish grey; the lower part between the 1st and

3rd median nervules filled up with black, the nervules themselves ochreous; a cloudy ochreous-brown oblique fascia from its lower end to the inner margin, and a small cloudy space on the costa above it; a sinuous, somewhat diffuse, ochreous exterior fascia, and a subterminal one consisting of interrupted dark grey cloudy spots; fringe white. Hind wings with a broad ochreous fuscous fascia, continued from the fore wings and almost obliterating the dark ocellus; exterior fascia greyer, broader and less sinuous than in fore wings. Underside with costa, ocelli, and exterior fascia all strongly marked, fuscous grey. Head, face, palpi, and vertex blackish; thorax and abdomen white; antennæ brownish. Differs from all other species by the dark markings of the underside.

Expanse of wings 44 millim.

Hab. Sikkim.

[Though the general aspect of this species might lead to its being mistaken for *P. deliaria*, it seems very distinct. I have one specimen only, from the interior.—*H. J. E.*]

SOMATINA LAPIDATA, sp. n. (Plate XXXII. fig. 7.)

♀. Fore wings pale stone-colour, suffused with darker, and irrorated with dark grey atoms and strigæ; a dull oblique basal line, and a thicker exterior line, bluntly angulated beneath the costa, can be traced; cell-spot small, dark; hind margin broadly dark olive-grey, with an aggregation of dark transverse strigæ. Hind wings with the basal third thickly dappled with dark grey atoms, the outer ⅔ with dark grey transverse strigæ, leaving a narrow pale curved space between the two darker portions, corresponding to a like paler space on the fore wings between the exterior line and the submarginal shade; fringes of both wings dark grey, with two paler lines and a black basal line. Face, palpi, vertex, and collar dull olive-green; patagia and thorax whitish grey; abdomen stone-colour mottled with dark grey. Underside pale ochreous, the veins yellower, with all the markings by contrast darker; a distinct dark cell-spot in both wings.

Expanse of wings 34 millim.

Hab. Naga Hills (*Doherty*).

This species is smaller than, and has a slightly dissimilar facies from, the others of the genus.

LIPOMELIA, gen. nov.

Fore wings with costa straight from the base, and gradually convex towards apex, which is bluntly rounded; hind margin obliquely curved. Hind wings ample, with hind margin rounded and inner angle square. Antennæ of ♂ thick, shortly ciliated; head broad; forehead flattened; palpi short, porrect, or slightly upturned; tongue present; hind tibiæ of ♂ flattened and curved; hind tarsi reduced to a short, hardly perceptible point. Neuration normal. Scaling fine and smooth.

Type, *Lipomelia subusta*, sp. n.

LIPOMELIA SUBUSTA, sp. n. (Plate XXXII. fig. 24.)

♂. Fore wings olive-drab, much suffused with tawny and brown; the olive-drab ground-colour is limited to the base, the costa, the apex more broadly, and the hind margin; the basal portion is edged by an oblique tawny line, starting from the inner margin close to the base, and running parallel to hind margin, ending in the middle of the cell; second line red-brown, commencing below the costa, forms first a large conical projection hindwards, then a double curve, and a second conical projection above the inner margin; the space between the two lines filled up with tawny, except along the costa, with some paler vertical wavy streaks on the inner margin; subterminal line irregularly dentate, almost touching hind margin below the centre; space between it and 2nd line filled up, in the lower $\frac{2}{3}$, with mahogany-brown; fringes olive-drab, with a fine tawny dot at end of each vein; discal spot elongated, white, shining, somewhat raised. Hind wings wholly tawny, mottled with brown, from base to subterminal line, then olive-drab; fringes as in fore wings; discal spot constricted in centre, sometimes divided into two spots. Palpi, face, and antennæ dark brown; vertex and collar red-brown; thorax and patagia olive-drab; abdomen tawny olive. Underside dull olive with a pink tinge; the inner region of the fore wings and the upper of the hind wings being suffused irregularly with blackish.

Expanse of wings 28 millim.

Hab. Sikkim; Naga Hills.

RHODOSTROPHIA SUBFLAVIDA, sp. n.

♂. Fore wings pale cinereous, dusted with darker, and tinged with ochreous; basal area diffusely darker, costa and hind margin more distinctly so; parallel to hind margin, and separated from the darker streak by a narrow pale space, is another oblique dark fascia of equal width with the dark portion of the hind margin; cell-spot dark. Hind wings pale whitish ochreous, with a faint yellowish tint, tinged with grey towards the anal angle; fringes of both wings with a distinct darker basal line. Underside of both wings whitish grey, strongly suffused with yellowish.

Expanse of wings 38 millim.

Hab. Kashmir.

There are several examples, all males, in the B.M. Coll. from Afghanistan.

Near *P. borealis*, Swinhoe.

[The type, in my collection, was taken at Sonamurg in Kashmir by the late Mr. Atkinson.—*H. J. E.*]

TANAOTRICHIA, gen. nov.

Fore wings with costa nearly straight, more curved just before apex; hind margin curved, more obliquely towards anal angle; hind wings with hind margin rounded, anal angle rather marked. Antennæ of ♂ beset with long close ciliations; palpi horizontally porrect, hardly reaching beyond face; tongue present. Hind tibiæ

of ♂ beset with long pencil of hairs, concealing spurs, if present. Neuration :—Fore wing : cell barely half the length of wing; disco-cellular obliquely curved; 1st median nervule at $\frac{5}{6}$; 2nd and 3rd from end of cell; lower radial from centre of discocellular; upper from top end of cell; areole double; 4th and 5th subcostals from end of areole, widely diverging; 2nd and 3rd shortly out of 4th. Hind wings with the two subcostal nervules very shortly stalked; the rest as in fore wing.

Type, *Tanaotrichia trilineata*, sp. n.

TANAOTRICHIA TRILINEATA, sp. n. (Plate XXXII. fig. 2.)

♂. Fore wings reddish ochreous or reddish, dusted with fine deeper red atoms; basal half of costa blackish; 3 red-brown transverse lines; the first fine, at $\frac{1}{4}$ bent beneath the costa, then vertical; the second thicker, oblique, slightly wavy, from $\frac{2}{3}$ of the costa to $\frac{2}{3}$ of inner margin; the third submarginal, straight at first from the costa and inclined slightly outwards, forms a sinus outwards towards the anal angle; fringes concolorous with darker red base. Hind wings like fore wings, but without the basal line; face and palpi red-brown; vertex whitish; collar reddish; thorax, patagia, and abdomen concolorous with wings. Underside paler, without irrorations; all the lines visible except the basal; the cell-spot of the fore wings also shown.

Expanse of wings 38 millim.

Hab. Sikkim.

[Taken by Mr. Gammie at about 3000–5000 feet.—*H. J. E.*]

ANISODES ARGENTISPILA, sp. n.

♀. Fore wings dull brick-red, with faintly darker markings; an indistinct fascia near base; a similar dark discal ocellus, with a faintly darker shade beneath it; a curved, slightly denticulate fascia at $\frac{2}{3}$; a subterminal one between the last and the hind margin, which appears as if interrupted below the middle; a marginal series of minute black dots between the veins; fringes concolorous. Hind wings like fore wings, but with a large irregular silvery-white discal spot, surrounded with dark grey; palpi and face brick-red; vertex whitish; thorax and abdomen pale pinkish ochreous. Underside dull pink, without markings.

Expanse of wings 32 millim.

Hab. Naga Hills.

PERIXERA OBSCURATA, sp. n. (Plate XXXII. fig. 20.)

♂. Wings sandy ochreous, dusted with greyish ochreous and with all the markings grey; inner, exterior, and subterminal line all irregularly dentate-sinuous; beyond the subterminal the wings are suffused with grey; costa of fore wings dark grey; discal spot present in both wings. Thorax, abdomen, and antennæ all sandy ochreous. Underside pale straw-colour, with all the markings dull rosy and a rosy blotch along the centre of the disk.

Expanse of wings 32 millim.

Hab. Sikkim.

IDŒA FALCIPENNIS, sp. n. (Plate XXXII. fig. 11.)

♀. Fore wings stone-colour, almost wholly suffused with cinereous, with a broadish, slightly sinuate subterminal fascia of the pale ground-colour, before and beyond which the grey suffusion is denser; a denticulate darker exterior line, a sinuous darker central shade, and a basal transverse line can just be traced; these are probably more distinct in other specimens; fringes pale grey, with the basal line black, interrupted by each nervule. Hind wings like fore wings, but with a distinct black cell-spot. Face, antennæ, and thorax stone-colour; abdomen the same, but dusted with grey. Underside paler, unsuffused, with the lines all distinct.

Hab. Sikkim.

This species may be distinguished by the shape of the wings; the fore wings having the costa strongly curved throughout, the apex bluntly falcate, and the hind margin obliquely straight. Hind wings with hind margin fully rounded, and somewhat broadly elbowed in the middle. The palpi are excessively minute. It is very probable that when more specimens, including the ♂, come to be examined, the species may have to form the type of a distinct genus.

[Two specimens of this distinct species, taken by O. Möller on Oct. 12, are in my collection.—*H. J. E.*]

IDŒA BUTYROSA, sp. n.

♂. Fore wings rather bright clay-yellow, with all the markings indistinctly deeper; a basal curved line, a central curved line just beyond a diffuse cell-blotch; an exterior, more denticulated line and a hardly paler subterminal space; fringes concolorous; a series of very minute dark dots at the base of fringes between the veins, most conspicuous towards the apex. Hind wings the same, with a minute dark cell-spot. Head, thorax, and abdomen all concolorous. Underside dull ochreous, with the lines only faintly visible, except the 3rd.

Expanse of wings 26 millim.

Hab. Sikkim.

[A single specimen was sent by Mr. Gammie from Mongpo, about 4000 feet.—*H. J. E.*]

Subfam. ASTHENINÆ.

AMATHIA NIGRONOTATA, sp. n. (Plate XXXI. fig. 18.)

♂. Fore wings white, crossed by a series of pale grey fasciæ, mixed with ochreous, traversed by finely darker sinuous lines, which towards the inner margin form black dashes on the veins; the fasciæ are 6 in number: two, narrow, near the base; a wider one before the middle; a still wider one beyond the middle; a narrow submarginal one, dotted with blackish and with two darker patches below the costa; and, lastly, a narrow marginal fascia; fringe spotted with blackish at the base. Hind wings pure white.

Head, thorax, and abdomen ochreous whitish. Underside dull white, with hardly any trace of markings.

Expanse of wings 34 millim.

Hab. Darjiling. Though taken at the same time and place as *A. rivularis*, this can hardly be the same species.

AMATHIA SANGUINIPUNCTATA, sp. n. (Plate XXXI. fig. 17.)

♀. Fore wings dull white; costa ochreous; basal patch, central fascia, and hind marginal area crossed by ochreous and fine dark lines, intermixed with blood-red spots. Hind wings dull white, without markings; the hind margin before the fringes being slightly greyer. Head and thorax ochreous. Underside dull greyish white.

Expanse of wings 28 millim.

Hab. Sikkim. From Jongri, at 13,000 feet.

AMATHIA RIVULARIS, sp. n. (Plate XXXI. fig. 16.)

♀. Fore wings pale yellowish ochreous, crossed by four irregular dark fasciæ, consisting of dark grey lines and streaks:—one basal, angulated exteriorly; the second before the middle, thickest in the costal half; the third beyond the middle; and the fourth subterminal; the first and second are twice bent before the inner margin; marginal space varied with grey; the veins blackish before the fringes. Hind wings ochreous whitish, with ochreous fringes. Head, thorax, and abdomen ochreous. Underside paler and duller, with the markings all dull grey.

Expanse of wings 34 millim.

Hab. Darjiling. Taken in May and June at an elevation of 7000 feet.

PHTHONOLOBA OLIVACEA, sp. n. (Plate XXXI. fig. 20.)

♀. Fore wings dull greyish green with a slight olive tinge, with the basal patch and 4 fasciæ darker green, traversed by fine darker lines; an indistinct dark cell-spot; the grey interspaces between the fasciæ are each traversed by a faint, slightly darker grey line. Hind wings dull grey, without markings. Head, palpi, thorax, and abdomen dull olive-green. Underside of both wings cinereous, with scarcely any markings.

Expanse of wings 32 millim.

Hab. Darjiling.

ASTHENA FLAVILINEA, sp. n.

♀. Fore wings sandy ochreous, dusted with darker, and traversed throughout by a succession of fine, much undulating, rusty ochreous lines running parallel to the hind margin. Hind wings similar; fringes sandy ochreous; both wings with a small black cell-spot. Head, thorax, and abdomen concolorous. Underside duller, more whitish, with similar markings.

Expanse of wings 26 millim.

Hab. Tonglo.

[A single specimen taken by myself in July at light is the only one I have seen.—*H. J. E.*]

ASTHENA (?) RUFIGRISEA, sp. n. (Plate XXXII. fig. 6.)

♀. Fore wings dull ochreous, more or less entirely overrun with obliquely curved grey fasciæ; basal area entirely grey, crossed by some very faint paler lines; central area ochreous, oblique, twice as broad on costa as on inner margin, containing a small dark cell-spot, and margined externally by an ill-defined rust-coloured line; this is followed by a broad, dark grey fascia which is externally bluntly lobed; and this again by 2 or 3 grey sinuate lines which become confused and shadowy towards the anal angle; fringes with a black spot at end of all the veins. Hind wings like fore wings, but the basal grey patch much smaller. Head, face, and thorax ochreous, tinged with grey; abdomen darker. Underside like upper, but much duller.

Expanse of wings 30 millim.

Hab. Sikkim.

ASTHENA OCHRACEA, Warr. P. Z. S. 1888, p. 321. (Plate XXXII. fig. 10, ♀.)

[Described as from the Punjab, but taken by me at Shillong on the Khasia Hills.—*H. J. E.*]

HYDRELIA LILACINA, sp. n. (Plate XXXII. fig. 4.)

♀. Fore wings dull pinkish grey, thickly dusted with vinous atoms, and crossed by indistinctly undulating vinous lines; 1st line at $\frac{2}{5}$, brownish purple, running slightly outwards for $\frac{1}{4}$, then inwards and slightly wavy; 2nd line at $\frac{3}{5}$, brownish purple, thickened towards costa, running parallel to hind margin, except in the middle, where it forms a bluntly angulated and indented projection outwards; fringes paler pink. Hind wings white, with only the fringes, the extreme hind and inner margin, and the commencement of a line on the latter vinous. Head, face, and abdomen like ground-colour; thorax itself brownish purple, like the lines of the fore wings. Underside of both wings glossy whitish (in the fore wings suffused with pinkish purple), with the exterior line distinctly pinkish on both wings.

Expanse of wings 34 millim.

Hab. Tonglo, Sikkim.

[The specimen described is larger, brighter, and has the angulated projection of the outer transverse lines less prominent than in another specimen also taken by me at about 12,000 feet on the Nepal frontier.—*H. J. E.*]

HYDRELIA MARGINEFUNCTATA, sp. n. (Plate XXXII. fig. 5.)

♀. Fore wings sandy yellow, with fine darker irrorations, the lines not denoted except along the costa, where can be counted 7 purplish-brown spots, the last 3 larger than the others; obliquely beyond the first 4 are 4 smaller dots on the subcostal; from the last 3 costal spots may be traced 3 transverse lines running parallel to the hind margin, and in places denoted by dots on the veins, the first 2 forming 2 short contiguous lines on the inner margin; fringes

sandy yellow, with no basal line, but with a series of purplish-black spots between the veins. Hind wings the same, but with no traces of any lines. Head, thorax, and abdomen concolorous. Underside pale straw-colour, with the marginal spots distinct: fore wings with the costa brownish, the costal spots prolonged into streaks, and a diffuse discal blotch; hind wings with a small discal dot, and a costal one above it, black.

Expanse of wings 30 millim.

Hab. Sikkim.

[Three specimens were taken by me, along with those of the last species, at 10,000 feet in July.—*H. J. E.*]

[I have examples of another species, perfectly distinct from both the last, which I took abundantly at Tonglo in July, and which Mr. Warren has also marked *lilacina* and for which I propose the name of

HYDRELIA SIKKIMENSIS, sp. n.

Fore wings dull pinkish grey, traversed by 5 distinct inner transverse lines, and 3 double darker outer ones, the two series separated by a broad pale band including a discal spot. Hind wing pale grey with a discal spot and three marginal and one internal darker transverse lines. Beneath dull pinkish grey, with discal spot on both wings, with one distinct transverse band and a marginal line of spots.—*H. J. E.*]

AUTALLACTA, gen. nov.

Fore wings broad; costa gradually arched throughout; apex distinct, minutely subfalcate; hind margin oblique, with a scarcely perceptible blunt elbow in the middle. Hind wings broad, with a distinct elbow in middle of hind margin. Palpi very short, not reaching beyond face; face rounded, protuberant; antennæ in ♀ simple, in ♂ subserrate. Neuration as in *Asthena*.

Type, *A. subobliquaria* (*Timandra*), Moore.

AUTALLACTA LINEATA, sp. n.

♂. Fore wings pale straw-colour, with rust-coloured lines, 4 curved near the base, one straight oblique in the centre, and 3 slightly wavy and irregular towards the hind margin; fringe straw-colour, with a rusty basal line. Hind wings with only the central and 3 submarginal lines. Underside rather darker; the fore wings with the basal lines not represented; head, abdomen, and legs all straw-coloured.

Expanse of wings 28 millim.

Hab. Sikkim.

This can hardly be an aberrant form of *subobliquaria*. The fore wings are decidedly concave from apex to middle of hind margin.

[I have seen only one specimen of this insect, which is very distinct. Mr. Warren has included under the name of *A. subobliquaria* two other species which I took at much higher elevations and believe to be distinct, but I will not now describe them.—*H. J. E.*]

CHALYBOCLYDON, gen. nov.

Fore wings broad; costa nearly straight, convex only just before apex, which is square; hind margin almost imperceptibly crenulated, bluntly elbowed in the middle; hind wings with hind margin similar. Neuration: cell of both wings very short, not more than $\frac{1}{3}$; discocellular very obliquely curved inwards; fore wings with the 1st median nervule at $\frac{3}{4}$, 2nd close before, the 3rd at, the end; lower radial from $\frac{2}{3}$ of the discocellular; upper radial from end of cell, 5 subcostals on a common stem, the 5th rising not far from its base, the 4th running into the apex, 1st, 2nd, and 3rd close together, one after the other. Hind wings with the costal anastomosing with subcostal for $\frac{3}{4}$ of cell; the two subcostals on a short footstalk; radial from $\frac{2}{3}$ of the discocellular; medians as in fore wing. Scaling close and smooth, with faintly metallic lines.

Type, *Chalyboclydon marginata*, sp. n.

CHALYBOCLYDON MARGINATA, sp. n. (Plate XXXII. fig. 16.)

♀. Fore wings pinkish drab, with a slight olive tinge; the base to beyond the middle chocolate-brown; across the centre of the wing a vertical thick angulated chocolate-brown line, diffusely bordered on either side with duller brown bands, the inner one expanding on the costa, both thickly sprinkled with fine lustrous lilac scales; shortly before apex, a Y-shaped chocolate-brown line runs obliquely to the hind margin at the elbow, then bends inwards nearly at right angles to its former course to above the anal angle, then vertical; space between hind margin and this line, and lower $\frac{1}{3}$ of the apical wedge, dull brown speckled with lilac atoms; apical $\frac{2}{3}$ lilac-grey; space between central and outer line traversed by a broad angulated fascia of lustrous lilac scales interspersed with a few darker ones; fringe-line chocolate-brown; fringes ochreous and fuscous mixed. Hind wings with the basal half wholly lilac-grey, containing a small black cell-spot, followed by 5 undulating fasciæ of the ground-colour, alternating with 4 lilac-grey fasciæ of exactly equal width; a submarginal line running close to, but not touching, the fringe-line, chocolate-brown; base of fringes chocolate-brown, but finer; space between the two lines lustrous lilac-grey. Head, face, and fore parts of thorax dark chocolate-brown; rest of thorax and abdomen ochreous drab. Underside silvery drab, with darker diffuse mottling and suffusion; fore wings with one, hind wings with two, distinct angulated brownish lines; cell-spot of hind wings distinct.

Expanse of wings 36 millim.

Hab. Sikkim; Momeit, Burmah.

[Seems a very scarce species in Sikkim, where it has only been taken in the interior by Möller's collectors. There is a smaller species of the same genus from the Karen Hills of which I have only one specimen.—*H. J. E.*]

POMASIA MONILIATA, sp. n. (Plate XXXII. fig. 9.)

♀. Fore wings fawn-coloured, with all the lines fine, white, very sinuous, and geminated, the first near the base, the second just before, the third beyond the middle; the fourth, submarginal, consists of a series of white-edged black-centred beads, followed by a blackish shade, and preceded above the inner margin by an oval blackish spot; fringes with pale basal line. Hind wings like fore wings, but without the basal line, and with the second and third not geminated, and approaching each other; between the bead-like line and the hind margin is an additional irregular whitish curved band, which can be faintly traced on the fore wing also. Head, thorax, and abdomen pale fawn-colour. Underside dull greyish ochreous, with scarcely any markings.

Expanse of wings 16 millim.

Hab. Khasia Hills.

[A single specimen taken by myself at about 5500 feet in September.—*H. J. E.*]

POMASIA DENTICLATHRATA, sp. n.

♂. Fore wings pale ochreous yellow, traversed from base to margin by a series of closely placed, sinuous, denticulated, pale liver-coloured lines, the yellower interspaces being more manifest along the costa and inner margin; the darker suffusion running across the disk; 14 of these dark lines can be counted. Hind wings the same, but with only 9 lines. Head, thorax, and abdomen similarly mottled. Underside yellower, with the markings dim and fuscous.

Expanse of wings 22 millim.

Hab. Naga Hills.

[Taken by Doherty at about 3000 feet.—*H. J. E.*]

Subfam. HYDRIOMENINÆ.

GLAUCOPTERYX STELLATA, sp. n.

♀. Fore wings fuscous olive, with the markings deeper fuscous, but indistinct; the paler interspaces starting as small yellowish spots on the costa, and being marked in their course across the wing by bluish-white linear dashes on all the veins, which are themselves dark fuscous; subterminal line, evenly undulating, delicate, bluish white; fringes with their basal half dark olive-grey, the outer half paler, preceded at their base by a thick black line, which is interrupted at the end of each nervule by a large white dot. Hind wings glossy grey, with an indistinct discal dot, and some undefined wavy grey lines towards the hind margin; fringe ochreous grey, preceded by a black line. Underside—fore wing almost wholly cinereous, the markings only showing towards the hind margin; hind wings showing a succession of alternate pale and dark undulating lines; veins towards the hind margin standing out still darker and lighter, where the lines cross them. Head, palpi, and thorax dark fuscous olive; abdomen paler.

Expanse of wings 42 millim.

Hab. Sikkim.

[Rare along the Nepal frontier at 11,000–13,000 feet, where it flies in July.—*H. J. E.*]

GLAUCOPTERYX PUNCTATISSIMA, sp. n.

♂. Fore wings dark ashy grey, with a slight ochreous tinge in places, with darker, almost blackish markings and suffusions; central fascia dark grey, its edges denoted by pale dots on the veins; a curved basal fascia and another indefinite beyond it; subterminal line a series of white spots, edged diffusely with blackish, and preceded by a darker shade; fringes grey, preceded at base by a broad black line, which is interrupted at end of each vein by a narrow white streak, and between the veins by a white squarish spot. In a second specimen the ground-colour is much paler, and the markings and suffusion blacker; the veins themselves black, picked out with white dots where the paler lines cross them, which also expand into pale grey blotches along the costa; discal spot black, distinct; hind wings dull grey, with dark discal spot, and dark line at base of fringes. Underside of both wings dull grey, with the markings indistinct; fringes pale, with distinct dark mottlings.

Expanse of wings 34 millim.

Hab. Sikkim.

[Commoner than the last in the same localities from 10,000–12,000 feet.—*H. J. E.*]

GLAUCOPTERYX VIRIDIS, sp. n.

♂. Fore wings dull green, crossed by darker green and fuscous wavy lines; basal patch with 3 curved dark fuscous lines and darker green lines between them; central fascia with its edges marked by darker bands of mingled green and fuscous; the centre, containing a small cell-spot, alone remaining paler; the fascia is followed by a series of pale dots on each vein; submarginal line regularly undulated, paler green, almost whitish; space between it and central fascia dull green, slightly tinged with pinkish, and with the veins marked with longitudinal black dots; on the costa are the commencements of 2 or 3 undulating dark lines; fringes dark green, preceded by a series of small double black dots. Hind wings dull fuscous, with faint traces of an undulating pale line before the margin. Head, thorax, and abdomen greenish. Underside greyish white, in fore wings much suffused with grey, with all the markings shown; hind wings with a central as well as submarginal dark band.

Expanse of wings 40 millim.

Hab. Sikkim.

[A single specimen only sent by Möller and taken in March, probably on the Nepal frontier.—*H. J. E.*]

PHOTOSCOTOSIA, Warr.

Trichopleura, Staud. (nom. præoc.).
Photoscotosia, Warr. P. Z. S. 1888, p. 327.
Lasiogma, Meyr. Tr. E. S. 1892, p. 70.
Type, *P. miniosata*, Wlk. (*Scotosia*).

PHOTOSCOTOSIA ATROMARGINATA, sp. n. (Plate XXX. fig. 1.)

♂. Fore wing with the ground-colour a mixture of dull olive and bronzy violet; a dark, curved, broadish, pale-edged line near the base; central band dull bronzy red, with the two lines that bound it black; the first, broad at the costa, concave basewards, but forming a sharp tooth pointing inwards between the two concavities on the median nervure; the second is likewise darker at the costa, beneath which it forms two small projections, between which a small tooth of the paler exterior ground-colour runs in; it reaches the inner margin with 5 small rounded waves, and the band itself is 3 times as broad on the costa as on the inner margin; marginal third a mixture of olive and dull reddish; an indistinct oblique blackish apical dash; a distinct black line at base of fringes. Hind wings white, slightly grey along the inner margin, and with the inner half of the hind margin narrowly sooty black. Head, thorax, and abdomen dark fuscous, tinged with olive. Underside of wings glossy greyish white; the fore wings darker along the disk and with the fringes much darker; both wings with a central curved denticulated dark grey line; hind wings with a distinct blackish cell-spot.

Expanse of wings 36 millim.

Hab. Sikkim.

Distinguished at a glance, independently of its smaller size, by the white hind wings with their sooty blotch.

[I took a single specimen of this distinct species at about 12,000 feet on Sundukpho in July.—*H. J. E.*]

PHOTOSCOTOSIA MULTILINEA, sp. n. (Plate XXX. fig. 10.)

♂. Fore wings fawn-colour, varied with grey and reddish brown; extreme base reddish grey, followed by a reddish-brown fascia, succeeded by a mottled grey and white fascia, and this by reddish-brown lines, which deepen externally into a rich red-brown fascia, the edge of which is slightly sinuous, and distinctly contrasted with the paler central space; discal spot dark brown, linear, just beyond the line; exterior line preceded on costa by a red-brown patch, forms two sharp teeth below the costa, and crosses the wing as a series of denticulate sinuations; it is followed on the costa and inner margin by a pale grey space crossed by numerous sinuous dark lines; rest of the wing dull reddish brown or reddish grey; hind wings smoky fuscous, with costal region whitish. Underside paler, with dark central costal spot; tuft of hairs black, with base tawny; hind wings dull grey.

Expanse of wings 54 millim.

Hab. Sikkim.

[Taken by Möller's collectors in the interior.—*H. J. E.*]

PHOTOSCOTOSIA FULGURITIS, sp. n. (Plate XXX. fig. 11.)

♀. Fore wings dark fuscous, with a tawny undertone; 1st line at ¼, pale grey, forming a large bidentate process outwards on the median vein; the basal ⅓ paler than the central, and crossed by darker lines shaped just like the pale first line, and by a straight pale line in the centre; exterior line at ⅔, white, very slightly indented below the costa, very slightly wavy to below the median vein, where it forms a single blunt tooth, then turns inwards with two curves to the inner margin; an indistinct, interrupted pale subterminal line, and a white oblique streak from the apex, crossing it and all but reaching the exterior line; fringes fuscous, with darker base. Hind wings with the costal region broadly whitish; the rest of the wing smoky fuscous, darker towards the hind margin, where there are traces of sinuate pale fasciæ. Head, thorax, and abdomen all dark fuscous. Underside of fore wings whitish, with a thick black line from the costa beyond the middle, and a broad dark cloud beyond it; costa yellowish; apex white; tuft of hairs black; cell-spot dark, linear. Hind wings whitish, much mottled with cinereous, with dark cell-spot and fuscous median band.

Expanse of wings 48 millim.

Hab. Sikkim.

[Several specimens were taken by me at 10,000–12,000 feet on the Nepal frontier in July.—*H. J. E.*]

EUSTROMA, Hüb. Verz. p. 335.

Type, *E. reticulata*, Schiff.

Distinguished by the *long black* tuft of hairs along the underside of the inner margin of the fore wings of the ♂ from *Lygris*, Hüb., in which the tuft is short and pale yellow.

EUSTROMA VENIPICTA, sp. n.

♂ ♀. Fore wings fuscous, with paler, more reddish markings; basal patch and central fascia dark fuscous, the former with a paler line along its centre; the latter with a darker, paler-edged centre; the basal patch is edged with a double dull tawny line; the central fascia is edged internally by an angulated, irregular tawny fascia; the space between this and the edging of the basal patch being filled in with dark fuscous; the median nervure, the 3 median nervules, and the submedian all strongly tawny, interrupting the darker markings; the central fascia is edged externally with a fascia formed of 3 pale and 2 dark lines, followed by a series of fuscous blotches, which are broader and wedge-shaped towards the costa, but gradually decrease towards the inner margin, and are bordered by a sinuous fine whitish line, which becomes broad and white above the inner margin; a similar whitish oblique line from the apex separates a small costal fuscous blotch from a larger triangular subapical one along the hind margin; fringes fuscous, with

darker bases. Hind wings cinereous ochreous, with 2 wavy paler fasciæ towards the hind margin, and the costal region pale. Head, thorax, and abdomen dark fuscous. Underside glossy, ochreous tinged with cinereous; basal $\frac{2}{3}$ of fore wings darker; hind wings with large black cell-spot, and 3 sinuous fasciæ.

Expanse of wings 46 millim.

Hab. Sikkim.

PARALOPHIA, gen. nov.

Fore wings with costa slightly convex at base and before apex; scarcely visibly concave in middle, apex blunt; hind margin obliquely curved; hind wings rounded. Antennæ of ♂ subserrate, shortly ciliated; of ♀ simple; palpi quite short, pointed, hardly reaching beyond face; tongue developed; neuration normal; abdomen of ♂ lengthened, with a strong apical tuft, and 3 curved large lateral tufts on each side of the 3 preceding segments.

Type, *Paralophia pustulata*, sp. n.

PARALOPHIA PUSTULATA, sp. n. (Plate XXX. fig. 7.)

♂ ♀. Fore wings greyish fuscous; basal region and central fascia darker; basal patch edged with a pale line, which is denticulate on the subcostal and median veins; inner edge of central fascia also edged with paler, forming 3 acute teeth on the subcostal, in the middle of the cell, and on the submedian; space between basal patch and central fascia filled up with fuscous and ochreous; outer edge of central fascia forming 4 irregular lobes in its costal third, 3 broader prominent ones in the middle third, and 3 smaller blunter ones in the lower third; it is followed by a paler band, whitish ochreous towards the costa, which is itself traversed by 3 fine fuscous lines, which follow the windings of the edge of the fascia; this pale band and its lines is interrupted between the upper and middle third of the central fascia by a white blotch (less conspicuous in the ♀); subterminal line consisting of a series of whitish or ochreous spots edged on either side with black, preceded on the costa by 2 or 3 dark fuscous blotches, and interrupted below the costa by an oblique fuscous pale-edged streak from the apex; the veins beyond the central fascia to the hind margin yellowish; fringes fuscous, mottled with paler. Hind wings glossy grey, with a darker line at base of fringes. Underside—fore wing dull dark cinereous from base to outer edge of central fascia; beyond as on the upperside, but duller. Hind wings with all the markings of the fore wings reproduced distinctly, especially the central dark line. Head, thorax, and abdomen fuscous.

Expanse of wings, ♀ 28 millim., ♂ 32 millim.

Hab. Sikkim.

[Taken by myself at Darjiling and Tonglo, where it seems uncommon. I have other specimens from Möller and Knyvett which vary somewhat in the outer band.—*H. J. E.*]

AMŒBE, Hüb. Verz. p. 333.

Type, *A. bidentata*, Hufn.

AMŒBE (?) NIVEOPICTA, sp. n. (Plate XXX. fig. 5.)

♀. Fore wings fulvous-brown; the markings black, with silvery-white edgings; basal region fulvous-brown, whitish along the inner margin, tinged with black on the costa, followed at ¼ by a broadish black bent fascia, which emits a conical spur just below the middle; this fascia is edged internally by a narrow, and externally by a broader, silvery-white line, the internal white line being itself edged by a narrow black one; central fascia black, much broader on the costa than on inner margin; edged on both sides with silvery-white, more broadly towards the costa, each silvery-white line edged narrowly with black; the inner edge of the central fascia emits a blunt tooth towards that on the outer edge of the basal fascia, the 2 white edges uniting, so enclosing an almost round fulvous-brown subcostal spot, above which is a small costal spot of the same colour, and on the inner margin a long vertical oblong one; the outer edge of the central fascia forms an acute angle below the costa, and a bilobed projection below the median vein; in its centre, on the costa, are 2 small divergent silvery-white streaks; subterminal line fine, black, edged externally with silvery-white, forms first a large curve from the costa to below the acute angle of the central fascia, then 3 small curves, and lastly runs vertically to the inner margin just before the anal angle; an obliquely curved, white apical streak uniting with the curve of the subterminal line; above this streak the marginal area is fulvous-brown; below it to the elbow of the wing black; thence to the anal angle snowy white, with a few darker clouds above the angle; space between central fascia and subterminal line uninterruptedly fulvous-brown. Hind wings white, with a greyish-black border, broadest towards the apex, and with a faint denticulated central grey line; fringes of the hind wings white, chequered with black, of the fore wings white with a black basal line from the elbow to the anal angle, above the elbow blackish, mottled with fulvous and white. Palpi, base of patagia, 3 large spots on thorax, and most of abdomen blackish; top edge of palpi, face, front of thorax, terminal half of patagia, and base of abdomen white. Underside—fore wings much duller, but with the same markings; the costa narrowly fulvous, with the white markings showing yellow there. Hind wings white, thickly sprinkled all over with coarse blackish atoms, and with 3 somewhat indistinct blackish parallel lines.

Expanse of wings 38 millim.

Hab. Sikkim.

An exceedingly handsome and striking insect. I have placed it in *Amœbe* in consequence of its superficial resemblance to the European *A. bidentata*, Hufn. The discovery of the larva will alone prove whether this position is correct.

[I took one ♀ of this beautiful and distinct species at Tonglo, and have another which agrees.—*H. J. E.*]

POLYPHASIA, Stph. Ill. iii. p. 230.

Type, *P. truncata*, Hufn.

POLYPHASIA ALBISERIATA, sp. n.

♂ ♀. Fore wings velvety blackish, dusted, especially towards the hind margin, with very fine golden-yellow scales; lines irregularly zigzag, consisting of lilac-grey scales; 1st at $\frac{1}{3}$; 2nd, forming the inner edge of the central fascia, at $\frac{1}{2}$, running in just below the middle into the fascia; 3rd at $\frac{3}{4}$, limiting the central fascia externally, contains 2 more prominent denticulations, one subcostal, the other at the middle; down the centre of the central fascia, beginning at the costa, runs a series of contiguous oval white spots, which does not reach the inner margin; submarginal line slender, undulating, pale golden; fringes dark fuscous, with a deep black line at base, interrupted at the end of each vein by a lilac-grey wedge-shaped spot. Hind wings smooth, fuscous, with the inner angle including the fringes clear white; rest of the fringes dark fuscous, preceded by a deep black line; traces of an undulating submarginal line edged with paler are visible towards the costa. Head and thorax velvety blackish; abdomen blackish, dusted with paler scales between the segmental divisions. Underside of fore wings rather glossy grey, paler towards the costa in the disk, and with a white apical patch; the line bounding the central fascia on the outside, and the discal spot, darker. Hind wings glossy whitish for $\frac{1}{2}$ from base; a distinct dark grey exterior line, followed by a diffuse, blotched shade, and dark fuscous fringes; apex of the wings broadly white.

Expanse of wings 46 millim.

In the ♀ the series of white spots in the central fascia is reduced to 3, and the whole submarginal area of both wings on the underside is whitish.

Hab. Sikkim.

[This distinct species seems common on the Sundukpho range at about 11,000–12,000 feet. It varies in the size of the white spots on the fore wing, which are sometimes almost obsolete.—*H. J. E.*]

POLYPHASIA ALBIANGULATA, sp. n.

♂ ♀. Fore wings dark fuscous or blackish, interspersed with deep tawny, the latter tints forming a more or less distinctly expressed fascia on either side of the central fascia; basal patch dark, edged in its lower half, finely but obscurely, with whitish; central fascia edged with a very strongly-marked, acutely biangulated thick white line, which in its upper half is internally irregularly dentate, and which ends on the inner margin with an outward curve; from the costa, in the centre of the central fascia runs a thick white line parallel to the upper arm, and not quite reaching the lower arm of the

line which edges the fascia; hind margin blackish, traversed by a bluntly denticulate, fine, lilac-grey submarginal and subterminal line; fringes chequered tawny and dark fuscous. Hind wings dark grey, with tawny fringes, interrupted with darker. Underside dark grey, with the white markings indicated.

Expanse of wings 40 millim.

Hab. Sikkim.

This is a very striking form, and, so far as the white markings go, does not, in the specimens which have come under my notice, appear given to variation. Whether it should be treated as a distinct species, or only as one of the many varieties of the Indian branch of *P. russata*, I must leave to further experience to decide.

[Two specimens were taken by me on the Nepal frontier at 11,000 and 13,000 feet in August, and seem to be a very distinct species.—*H. J. E.*]

CIDARIA DENTISTRIGATA, sp. n. (Plate XXX. fig. 4.)

♂. Fore wings dark slate-colour, with a purplish tinge; basal patch dull rufous, followed by a pale lilac-grey fascia, the outer edge of which forms a blunt projection below the costa; this fascia is traversed by 3 fine parallel lines, the first of which is rufous and the other two purplish-slate colour; central fascia purplish-slate colour, its inner edge still darker; its outer half traversed by 3 dark much denticulated lines, followed by a paler slate-coloured fascia, down the centre of which runs a fine equally denticulated dark purple line; this again is succeeded by a rufous fascia, edged with darker and spots of lilac-grey; marginal area uniform rufous slate-colour, along with the fringes. Hind wings satiny white, smoky along the inner margin and the hind margin, and with 3 or 4 abbreviated wavy darker lines before the inner angle. Underside: fore wings wholly cinereous; hind wings whitish, with cinereous hind margin, both with only a discal spot and central line for markings. Head, thorax, and abdomen all dark fuscous.

Expanse of wings 32 millim.

Hab. Sikkim.

[Three males which do not vary were taken by me at 10,000 feet in July and are the only ones I have seen of this distinct species.—*H. J. E.*]

CIDARIA INTERTEXTA, sp. n. (Plate XXX. fig. 3.)

♂. Fore wings with the darker fasciæ dull olive-green, the paler intervals being pinky drab; basal patch dull green, with 2 largish teeth, the upper one near the costa the larger; it is traversed along its centre by a pale drab line; the outer edge runs obliquely outwards for its upper $\frac{1}{3}$, then obliquely inwards for the other $\frac{2}{3}$; between the basal patch and the central fascia is a similarly indented pale drab fascia, traversed by 3 dull chocolate sinuous lines, the space between the first 2 of these being filled up with similar coloured atoms; central fascia olive-green, with 2 pale drab lines,

and a chocolate mottled central space; its outer edge is marked by a pale, round lobed, and somewhat dentated line, and it is partially interrupted below the middle by pale mottlings along the median nervules; following the pale line come 3 or 4 dark fuscous lines separated by similar paler ones, then a denticulate pale subterminal line; hind margin wholly olive-green; fringes mottled. Hind wings dull fuscous, with faint traces of a darker central fascia. Head, thorax, and abdomen mixed with olive-green and drab.

Underside of fore wings dull cinereous, with the costa, a large ocelloid patch beyond the central fascia, and a chain of spots representing the subterminal line, yellowish. Hind wings yellowish white, dusted and suffused with fuscous, with traces of 2 dark lines and a cell-spot.

Expanse of wings 28 millim.

Hab. Sikkim.

CIDARIA EXQUISITA, sp. n. (Plate XXX. fig. 2.)

♂. Fore wings with the basal third and central fascia rich olive-brown; basal patch crossed by a bluish-silvery line and separated from the central fascia by a narrow rusty-ochreous space, edged externally by a zigzag bluish silvery line; central fascia edged externally by a similar line, and with 2 or 3 indistinct silvery lines down the middle from the costa; a bright fulvous patch beyond the centre of the central fascia; a costal subapical brown patch; an oblique bluish line from the apex; fringes olive-brown, chequered with bluish. Hind wings wholly dull grey, but with chequered fringes. Underside dull fuscous; the hind wings with bluish fasciæ and markings; all the fringes mottled with bluish.

Expanse of wings 30 millim.

Hab. Sikkim. Taken at Tonglo in July, at 10,000 feet.

EPIRRHOË, Hüb. Verz. p. 328.

Type, *E. biriviata*, Borkh.

Male antennæ scarcely pubescent.

EPIRRHOË (?) LATIFASCIATA, sp. n.

♀. Fore wings brownish fuscous, with a reddish tinge in certain lights; basal patch edged with 2 curved whitish lines close together, but separated by a brown line of same width; a similar single white line across its centre; central fascia broad, edged externally by an irregularly dentate white line which forms a rather large sinus inwards above the inner margin; marginal area fuscous, more mixed with white, so that the white submarginal line is not particularly distinct; the hind margin itself with 3 brown blotches—one apical, one just above the middle, the third above the anal angle; space on each side of the central one whitish; fringes brownish, with pale base and a blackish basal line; a rather large, bent, black cell-spot. Hind wings whitish grey towards base, fuscous beyond,

with the exterior and submarginal lines represented. Underside whitish, suffused and mottled with fuscous, with the cell-spots large and dark; the outer line in both wings dark, denticulate, and picked out with white; face, head, patagia, thorax, and extreme base of wings whitish; abdomen fuscous.

Expanse of wings 26 millim.

Hab. Sikkim.

Very much like *Epirrhoë minuta*, Butler, but larger and darker. The two form a group by themselves, being distinguished by the irregularly elbowed hind margin of both wings.

EPIRRHOË SUBFALCATA, sp. n.

♂. Fore wings whitish, dusted with fuscous, and with fuscous markings; basal patch fuscous, traversed by a narrow paler fascia, edged with a whitish line, which is angulated on the subcostal; central fascia edged internally with a similar white line, which forms a small sharp tooth on the median; space between the basal patch and central fascia whitish, thickly dusted with fuscous grey; central fascia nearly twice as broad on the costa as on the inner margin, traversed by two paler sinuous lines which form a more or less regular series of curves inwardly concave; space immediately beyond whitish, running in in the form of small, sharp teeth along each vein; a dark blotch on costa before apex, consisting of 3 superposed blunt wedge-shaped spots; a dark cloud at the apex, and 3 dark triangular blotches beneath the apex along the hind margin; fringes fuscous, with blackish marks along the base. Hind wings white, tinged with grey, and with faint traces of 3 curved fasciæ before the hind margin and an indistinct cell-dot. Head, thorax, and abdomen all fuscous grey. Underside whitish, tinged with grey; the fore wings from base to outer edge of central fascia darker grey; cell-spot on both wings large, diffuse.

Expanse of wings 32 millim.

Hab. Kulu (*Grahame Young*).

Distinguished by the slightly produced apex and slightly falcate fore wings.

XANTHORRHOË, Hüb. Verz. p. 327.

Type, *X. montanata*, Schiff.

Male antennæ pectinated.

XANTHORRHOË OBFUSCATA, sp. n.

Fore wings pale grey, dusted with ochreous, and variously suffused with smoky fuscous; this smoky suffusion generally embraces the basal $\frac{1}{2}$ or $\frac{2}{3}$ along the costa, the apical region, and the anal angle; the exterior edge of the central fascia forms 2 rounded projections, each having 3 lobes, the first in the costal third, the second in the middle of the wing, the lower third of the central fascia running vertically waved; it is followed by a pale grey wavy fascia traversed by one or two darker lines, and a succession of wavy dark and lighter lines can be sometimes traced

through the basal patch; the middle of the hind margin is generally paler, thus separating the dark suffusion at the apex from that at the anal angle; fringes smoky fuscous, somewhat reddish tinged towards the anal angle. Hind wings entirely dark smoky fuscous. Head, thorax, and abdomen dark fuscous. Underside dull grey with some indistinctly waved shades.

Expanse of wings 24 millim.

Hab. Sikkim; Naga Hills.

This is a very indistinct looking and yet variable insect. Sometimes the suffusion only extends to the costal portion, leaving the inner margin of the wing pale; in others it embraces the greater part of the wing.

PERIZOMA, Hüb. Verz. p. 327.

Emmelesia, Stph. Ill. iii. p. 297.

Type, *P. albulata*.

PERIZOMA VARIABILIS, sp. n. (Plate XXX. fig. 17.)

Fore wings greyish fuscous, with very indistinct transverse markings; basal patch darker, divided in the middle by a paler band, which is itself traversed by a thread-like line; and followed by a similar pale band separating it from the central fascia, which varies in width, and is also followed by a pale band like the other two; marginal area irregularly darker, in which can be traced an indistinct submarginal line formed by a series of more or less distinct white dots or spots; sometimes 3 or 4 in a line from the costa, and 2 or 3 above the anal angle, but always one more clearly marked, in the middle, running in towards the base, and wedge-shaped; fringes unicolorous; the outline of the basal patch and central fascia varies, being sometimes curved, bluntly angulated, or acutely angulated; a distinct black cell-spot. In one varietal form the pale bands are decidedly greenish and more lustrous; in a second, the costal space beyond the central fascia is dull tawny; in a third, the submarginal spots are all distinct and the central one forms a large round white space. Hind wings of all the forms pearly-white, with a small dark cell-spot and a dark basal fringe line, and sometimes a fuscous or grey suffusion near the anal angle; some specimens have only faint traces of a central curved line, others have the line distinct. Underside of both wings glossy grey, darker or lighter, with the markings of varying intensity. Head, thorax, and abdomen fuscous; face sometimes paler.

Expanse of wings 22–26 millim.

Eight examples, 4 ♂, 4 ♀, all from Tonglo, Sikkim. This variable species is slightly smaller on the average than *P. affinis*, Moore, and may be at once distinguished by the smooth glossy scaling and the lustrous paler spaces, especially along the inner margin of the fore wings.

[A common species on the Nepal frontier from 10,000 to 13,000 feet in July.—*H. J. E.*]

PERIZOMA APICISTRIGATA, sp. n. (Plate XXX. fig. 19.)

♂ ♀. Fore wings with the dark spaces velvety, fuscous; the basal patch divided by a fine yellowish twice-curved line, and followed by an irregular yellowish, somewhat denticulated, nearly vertical, fascia traversed by a fine line; central fascia broadest in centre, where its outer edge forms two blunt lobes; followed by a pale fascia traversed by a fine dark line, the inner half being silvery white, the outer yellowish; marginal space occupied by a subquadrate velvety-fuscous patch throughout the costal half, and becoming more or less yellowish below, with a fuscous anal blotch, and two smaller ones above it; submarginal line composed of distinct white spots, 4 in a line from the costa, a larger one wedge-shaped in the middle, and 4 smaller ones beneath, one on each of the smaller fuscous blotches, and 2 on the anal blotch; an oblique silvery-white apical streak; fringes fuscous tinged with yellowish. Hind wings pearly white with a greyish tinge; a dark basal fringe-line, and traces of the beginning of two dark lines at the anal angle. Face yellow; head, thorax, and abdomen fuscous. Hind wings dark grey, mottled with paler, with the submarginal white spots reproduced.

Expanse of wings 24 millim.

Hab. Sikkim.

Although so very distinct in appearance, it is quite possible that this example may be only a remarkable variety of the variable *P. variabilis*, above described.

[As I have four specimens all agreeing and no intermediate forms among my long series of *P. variabilis*, I look on this as a perfectly good species. It occurs with the last at 10,000–13,000 feet, but seems much less common.—*H. J. E.*]

PERIZOMA LACTEIGUTTATA, sp. n. (Plate XXX. fig. 16.)

♂ ♀. Fore wings bronzy fuscous, with the ordinary lines and markings represented by a series of snow-white spots, one in the centre near the base of the wing; a curved series of 5, representing the pale fascia which usually divides the basal patch; a similarly curved series of 7, representing the outer edge of the basal patch; an indistinct series of 7, the two costal ones the largest, forms the inner edge of the central fascia; a more distinct and curved series of 9 forming its outer edge, the first, third, and ninth being much larger than the rest; an irregular submarginal series of spots; and lastly a series of distinct roundish dots at base of fringes, the 2nd being pear-shaped, the 5th and 6th connected by a quadrate blotch; the 8th enlarged upwards into an irregular blotch; through the space representing the central fascia runs a series of white dots of which the 3 top ones alone are distinct; in the disk a large irregularly trilobed white spot, with a still larger one below it; the costal and inner marginal spots of all the series are the largest; fringes brown, chequered with white between the marginal white spots. The spots are not symmetrical on the right and left wings;

the right having the large trilobed discal spot represented only by 3 small unconnected white dots, and the lower blotch by 2 semi-detached oblong ones; in the right wing the 3rd costal spot from the base is reduced in size and farther from the base; while in the left wing a small additional double spot has crept in between the 4th and 5th, which is scarcely perceptible on the right wing. Hind wings dull grey, with traces of 4 curved whitish fasciæ, most distinct on the inner margin, and a marginal row of white spots. Head, antennæ, and thorax bronzy fuscous; vertex with a snow-white spot; thorax with a pair of white spots in front, and probably three more behind; abdomen grey like the hind wings, with an indistinct row of pale dots along the back. Underside dull bronzy fuscous, with every one of the white markings of the upper-side exactly reproduced.

Expanse of wings 26 millim.

Hab. Sikkim. A very distinct looking insect, though the markings follow the pattern of the other allied species of *Perizoma*.

[Rare on Tonglo in July. I also have two from Möller dated October.—*H. J. E.*]

PERIZOMA BICOLOR, sp. n.

♂. Fore wings glossy umber with a reddish tinge; central fascia, the edges of which are irregularly dentate, and which occupies just one third of the wing, blackish fuscous; the whole wing also with a slight olive tinge; a dark line visible close to the base; a dark linear cell-spot, and a darker sinuate central shade along the middle of the central fascia; hind margin deeper tinged; submarginal line composed of a series of slight whitish spots; fringe concolorous with black basal line. Hind wings glossy white, tinged with grey along the hind margin; fringes rufous. Head, thorax, and abdomen concolorous. Underside of fore wings cinereous, fuscous-tinged, whiter towards hind margin; with the submarginal series of spots whitish; hind wing whitish, dappled with grey, with no distinct lines.

Expanse of wings 26 millim.

Hab. Sikkim.

[A single specimen taken by myself at light at about 12,000 feet.—*H. J. E.*]

PERIZOMA FASCIATA, sp. n. (Plate XXX. fig. 20.)

♂ ♀. Fore wings bronzy fuscous-brown; the central fascia bounded on either side by a sinuous white fascia, each of which is traversed by a darker line; these two fasciæ are most distinct towards the costa, and the inner is irregularly denticulate outwards in the middle; a single sinuate white line across the centre of the basal patch; submarginal line indicated by a row of varying-shaped white spots; followed by a similar series of white spots, but smaller, before the base of the fringes, which is black; the marginal area is interrupted in the middle by a roundish white blotch; fringes rufous and grey. Hind wings glossy white, darker

towards the hind margin; fringes yellowish. Head, thorax, and abdomen concolorous with fore wings. Underside of fore wings cinereous, with the 2 outermost series of spots and the costal portion of the exterior fascia white; hind wing glossy white, with the basal area fuscous, and 5 denticulated curved fasciæ, of which the 2nd and 4th are thickest.

Expanse of wings 24 millim.

Hab. Sikkim.

[A common species along the Nepal frontier in July, from 10,000 to 12,000 feet.—*H. J. E.*]

PERIZOMA INTERRUPTA, sp. n. (Plate XXX. fig. 18.)

♀. Fore wings fuscous with slight tawny shades; the central fascia bounded on either side by a broadish pale fascia, each traversed by a dark line; the fascia itself traversed by two or three paler lines; basal patch traversed by a narrower pale fascia, also divided by a darker line; marginal area darker fuscous; submarginal line composed of the usual series of white spots; marginal area interrupted below the middle by a subquadrate pale whitish blotch; the exterior fascia being likewise interrupted at the same place by a dull greyish-fuscous cloud; fringes fuscous, chequered with paler, with the basal line broad, black, interrupted by a small pale dot on each vein. Hind wings whitish grey, with fringe and basal line as in fore wings. Head, thorax, and abdomen fuscous. Underside of fore wings cinereous, with the submarginal series of spots and costal end of exterior band whitish; hind wings whitish, with a dark discal spot, and 5 more or less distinct denticulated curved bands, of which the 2nd and 4th are thickest.

Expanse of wings 28 millim.

Hab. Sikkim.

Near *P. seriata*, Moore, and of the same size.

PERIZOMA (?) ALBIDIVISA, sp. n.

♂. Fore wings dull brownish; basal patch bounded by a pair of very fine, parallel, white thread-like lines, curved a little below the costa, the outer of the two emitting a small tooth outwards in the cell and in the space between the median and submedian; basal patch itself subdivided in the centre by a single fine thread-like line; central fascia thrice as broad on costa as on inner margin, its outer edge bluntly elbowed in the middle; followed by a pair of fine white lines, the inner of which emits 2 teeth inwardly towards the corresponding teeth of the line between the basal patch and central fascia; these two lines are followed immediately by a single, more irregular, whitish line; subterminal whitish, consisting of a series of small curves; the four whitish lines forming an indistinctly expressed whitish patch below the centre of hind margin; space above and below this patch, between the subterminal and exterior lines, distinctly brown on costa and inner margin; fringe brown, preceded by indistinct series of dark spots. Hind wings cinereous fuscous, with markings visible only at anal

angle. Head, face, thorax, and abdomen fuscous. Underside cinereous, tinged with luteous, with the markings faint.

Expanse of wings 18 millim.

Hab. Naga Hills.

[Several specimens taken by Doherty in July agree with the type.—*H. J. E.*]

PERIZOMA CONJUNCTA, sp. n.

♂ ♀. Fore wings white; the edge of the basal patch represented by a curved dark brown-black fascia, the costa itself from the base being suffused with fuscous; central fascia indicated by very fine grey lines, each marked by a minute black dot on the veins; discal dot large, black, touching a brown-black quadrate patch, which occupies the costal portion of the fascia, and contains a tawny line along the subcostal; the outer edge of the central fascia has a small angulation below the costa and a bilobed projection below the middle, beneath which it is suddenly contracted in width; hind marginal space a mixture of fuscous tawny, grey, and white; the subterminal line appearing as a series of regular white undulations, preceded immediately by a narrow tawny fascia; fringes mottled grey and white, preceded by an irregular series of black lozenge-shaped spots; between the basal patch and central fascia and beyond the latter a broad pale band, each traversed by a fine thread-like line; the lower part of the central fascia is slightly darkened with grey, and contains two grey transverse lines, dotted with black on the veins. Hind wings dull fuscous, with the margin and discal dot darker. The above description applies to the ♀; in the only ♂ examined, the *whole* of the central fascia is filled up with brown-black. Face, vertex, collar, and patagia snow-white; thorax itself brown-black, as are the palpi; abdomen greyish ochreous. Underside glossy grey, dusted with darker, and with all the dark markings of the upperside denoted.

Expanse of wings 20 millim.

Hab. East Pegu.

[Taken at 4500 feet in the Karen Hills by Doherty in April.—*H. J. E.*]

GAGITODES, gen. nov.

Anticlea, Moore, Lep. Coll. Atk. p. 273.

Fore wings elongate triangular, bluntly subfalcate; costa straight, except at extreme base and apex, where it is curved; hind margin faintly indented below apex, and showing a slight elbow at end of third median nervule; hind wing rounded. Palpi rough, shortly porrect; antennæ simple, somewhat thickened and flattened in ♀. Thorax with a double crest of short erect scales behind. Scaling smooth and fine. Neuration:—1st median nervule at about half the length of cell; 2nd and 3rd from lower angle; lower radial from middle of the discocellular; upper radial from below the upper angle; last 4 subcostal nervules from

a common stem from the upper angle of cell, the 5th starting halfway; the 2nd, 3rd, and 4th, one after the other, in the order named. Hind wings with the cell broad and the discocellular angulated; the subcostal nervules on a common stem.

Type, *G. schistacea*, Moore (*Anticlea*).

GAGITODES OLIVACEA, sp. n. (Plate XXX. fig. 6.)

♀. Fore wings olive, suffused with darker; basal patch small, velvety black, finely edged with white, not reaching the inner margin; central fascia interrupted in the middle; costal portion shaped something like an hour-glass, velvety black, edged with white; lower portion short, of the ground-colour, toad-stool shaped, edged with whitish; submarginal line sinuous, irregular, white, twice interrupted; fringes olive, with darker dots at end of veins. Hind wings and fringes dull whitish, with black dots at end of veins. Head, thorax, and abdomen olive. Underside ashy, with the basal half of both wings darker.

Expanse of wings 28 millim.

Hab. Sikkim.

[A pair of this distinct species are all I have seen. I collected them on Sundukpho at about 12,000 feet in July.—*H. J. E.*]

EURYPEPLODES, gen. nov.

Fore wings ample, with costa curved throughout, and with an indistinct bulge about $\frac{1}{3}$ from the base; apex blunt; hind margin evenly and strongly curved. Hind wings broad, rounded; hind margin slightly elbowed below the middle. Antennæ, ♀, simple, slender; forehead decidedly projecting; tongue present; palpi as in *Iramba*, long, rostriform, loosely scaled beneath. Neuration:—Fore wing: cell half the length of the wing; discocellular curved and oblique; 1st median nervule at $\frac{2}{3}$; 2nd shortly before end; 3rd from the end; the median nervure between the 2nd and 3rd inclined upwards; lower radial from a little above the centre of the discocellular; areole simple but large; upper radial from just above its lower angle; 5th subcostal from just below its upper angle; 1st subcostal also just before the upper end; 4th from the upper angle; 2nd and 3rd out of 4th at $\frac{1}{3}$ and $\frac{2}{3}$ respectively. Hind wings: cell unusually broad, somewhat contorted; costal anastomosing with subcostal to near the end of cell; 2 subcostals on a common stem; discocellular subangulated; radial from the angulation; median nervules as in fore wings.

Type, *Eurypeplodes irambata*, sp. n.

The genus seems intermediate between *Hydrelia* and *Eupithecia*, having the shape and markings of the former, with the raised cell-spot of the latter, and the palpi of *Iramba*. I have not seen a ♂.

EURYPEPLODES IRAMBATA, sp. n. (Plate XXX. fig. 8.)

♂. Fore wings pinkish testaceous, with a succession of darker, slightly wavy lines, angulated on the subcostal, and darker thence to the costa; those forming the edges of the central fascia show as small

brown streaks on the costa; subterminal line indicated by a series of whitish dots on the veins; fringe concolorous; discal spot small, black, consisting of raised scales. Hind wings like fore wings, but with the base and costal region pale and less marked with lines; face, thorax, and abdomen concolorous; vertex paler; palpi dark brownish. Underside duller, almost without markings; both wings with cell-spots dark.

Expanse of wings 30 millim.

Hab. Sikkim.

[One ♀ was taken by myself at about 10,000 feet, and two more by my collector on the Nepal frontier.—*H. J. E.*]

CALLUGA MODESTA, sp. n.

♂. Fore wings sandy, more or less suffused with greyish; more grey towards the hind margin; margin of basal patch and inner edge of central fascia indistinctly defined and angulated; external edge of central fascia denticulated near the costa, where it runs outwards, then deeply indented, and undulating towards the inner margin; it is finely margined throughout with whitish, which forms a wedge-shaped blotch at the indentation; submarginal line distinct, finely denticulated, fringes paler at their apices, with a fine blackish basal line. Hind wings sandy grey, less grey at the extreme base; basal $\frac{2}{3}$ traversed by 3 or 4 indistinctly expressed, undulating, darker lines; marginal grey area traversed by a fine undulating paler line, a pale fascia, with a fine darker central line, between the grey basal $\frac{2}{3}$ and the marginal area. Head, thorax, and abdomen sandy ochreous. Underside dull straw-colour, with the markings grey.

Hab. Darjiling.

[Taken by me at light, the only one I have seen from Sikkim, but two from East Pegu appear to be the same species.—*H. J. E.*]

IRAMBA SPISSIDENTATA, sp. n.

Fore wings fuscous with an olive tint, with very indistinct markings; an inner, outer, and subterminal pale fascia, each edged and traversed by a very much denticulated dark line; cell-spot large, dark. Hind wings the same. Head and thorax concolorous. Underside dull ashy, with the basal $\frac{2}{3}$ rather darker.

Expanse of wings 16 millim.

Hab. Sikkim.

A very obscure-looking species.

EUPITHECIA COSTIPICTA, sp. n. (Plate XXX. fig. 21.)

♀. Fore wings pale whitish grey, with the lines forming on the costa 4 dark and darker-edged spots, each preceded by a single small dot; all the lines are angulated below the costa, and then run parallel to hind margin; marginal space beyond the subterminal line slightly darker; fringes concolorous with dark basal line. Hind wings pale grey, with many wavy indistinct lines, which, as usual, are plainer along the inner margin. Head and

thorax grey; abdomen darker, tinged with reddish. Underside pale, with the lines indistinct, but the cell-spots in both wings expressed.

Expanse of wings 26 millim.

Hab. Sikkim.

[A single specimen only, in perfect condition, taken by one of my native collectors at about 8000 feet.—*H. J. E.*]

EUPITHECIA RUBRINOTATA, sp. n. (Plate XXX. fig. 22.)

♀. Fore wings dull ochreous green (probably, when fresh, brighter green), with a basal, angulated second, and curved exterior line, all blackish and marked more distinctly on the veins; between the 2nd and 3rd on the costa lies an irregularly triangular brick-red blotch. Hind wings with a blackish cell-spot and the 2nd and 3rd lines represented. Head, thorax, and abdomen concolorous; the latter with a broad black band and black dorsal and lateral dots. Underside paler, with the base of the costa, the cell-spots, and outer line all broadly black.

Expanse of wings 24 millim.

Hab. Sikkim.

The specimen above described is not in very good condition.

EUPITHECIA ATROVIRIDIS, sp. n. (Plate XXXI. fig. 19.)

♂. Fore wings apple-green, paler at the base and along the costa; basal line denoted by 3 black spots, one on costa and inner margin, the central one on the median vein; costa brown-black from base to the first spot; 2nd line starts as a blackish triangle on the costa, and, like the basal, is denoted by a small dark spot on the median, and a longer oblique one on the inner margin; exterior line starts as a small triangle on the costa, and is denoted by a curved series of black dots on the nervules; a blackish, square, apical and subapical blotch, and a smaller one at the anal angle; subterminal line pale and sinuous; fringes green. Hind wings green, with the 2nd and 3rd lines only represented. Head, face, and thorax pale ochreous flesh-colour; abdomen the same, with a black ring near the base. Underside glossy, pale, with the markings darker, the exterior line especially in both wings being broad, blackish, and elbowed.

Expanse of wings 18 millim.

Hab. Naga Hills.

[Doherty, 7000 feet.—*H. J. E.*]

EUPITHECIA ALBISPUMATA, sp. n. (Plate XXX. fig. 23.)

♀. Fore wings elongated, reddish fawn-colour, crossed by numerous alternate dark and light transverse lines, running parallel to hind margin, but angulated towards the costa; discal spot large, black, vertical, preceded by a mixture of grey and whitish scales, and followed by whitish scales, which stretch along the veins beyond the cell towards the hind margin; submarginal line fine, pale; fringes dark grey. Hind wings dull greyish white, much peppered

with dark grey and blackish along the inner margin. Head and thorax fawn-colour; abdomen more mixed with grey. Underside pale grey, slightly glossy, with alternate light and dark grey bands; both wings with black cell-spot.

Expanse of wings 26 millim.

Hab. Khasia Hills.

Subfam. Ortholithinæ.

ORTHOLITHA DUPLICATA, sp. n.

♂. Fore wings pale cream-colour; the costa broadly and suffusedly greyish fuscous; basal patch also greyish fuscous, its outer edge oblique, darker, not nearly reaching the costa; inner edge of central fascia represented by a long, curved, dark brown tooth, not quite reaching the cell-spot, which is linear and dark brown; outer edge, by a similar but longer and more curved fascia-form marking, reaching only to the subcostal; space between them pure cream-colour; the narrow pale space between the basal patch and central fascia traversed by a grey line, thickening upwards; beyond the central fascia a pale curved fascia of the same width as the dark exterior margin of the central fascia, traversed by 2 somewhat geminated brownish lines; hind margin brownish, the inner half the darker, with a pale line down the middle; fringes fuscous. Hind wings creamy white, slightly darker towards the fringes. Head, thorax, and antennæ greyish fuscous; abdomen lighter. Underside ochreous, almost entirely suffused with pinkish grey, with the upper markings showing through.

Expanse of wings 38 millim.

Hab. Chumbi.

[My native collectors brought a few examples of this distinct species from the Tibet frontier in 1883, and I have since had one from Möller; I believe it occurs at great elevations.—*H. J. E.*]

Subfam. Urapterygin.æ.

SIRINOPTERYX RUFILINEATA, sp. n.

♂ ♀. Larger and brighter than *rufivinctata*, Wlk., and with the 2 transverse lines also reddish like the costa and fringes.

Hab. Khasia and Naga Hills; Sikkim.

[The type specimen of this, which I took in September in the Khasia Hills, and which agrees with a Naga Hill specimen, is distinct enough, but some other Naga and Sikkim specimens show that the characters on which Mr. Warren has relied are not very constant, and I am unable at present to confirm his opinion. —*H. J. E.*]

SIRINOPTERYX UNDULIFERA, sp. n.

♂. Fore wings pale canary-yellow, more or less thickly strewn with coarse rusty, or rusty-brown, atoms, which are finer and denser along the costa, the base of which is brownish; 2 oblique rusty-brown lines, one from $\frac{1}{3}$ of the inner margin to the costa beyond

the middle, the other, consisting of a series of small curves, from $\frac{2}{3}$ of inner margin into the apex; cell-spot distinct brown; fringes rusty, deepest at their base. Hind wings with brown cell-spot, and one central transverse rusty-brown line. Face, vertex, collar, thorax, and abdomen yellow; palpi, upper part of face, and front of thorax rusty-brown. Underside paler.

Expanse of wings 46 millim.

Hab. Sikkim.

[Four examples of this species were taken in March by Mr. Knyvett's native collectors, and agree with a fifth sent by Möller. It seems a distinct species.—*H. J. E.*]

Subfam. Deilinhinæ.

Aplochlora, gen. nov.

Iodis?, Wlk. xxii. p. 544.

Fore wings with costa evenly arched from base to apex; hind margin simply and obliquely curved; hind wings rounded, with a scarcely perceptible elbow in the centre of hind margin. Palpi extremely short; antennæ in ♂ simple; hind tibiæ with 4 long spurs. Neuration as in *Bapta*. Although the green coloration of the species suggests an affinity with the Geometrinæ, this is merely superficial; the hind wings are without a radial.

Type, *Aplochlora vivilaca*, Wlk. (*Iodis*).

Aplochlora viridis, sp. n. (Plate XXXI. fig. 7.)

♂. Fore wings pale green, without markings; a small black discal dot; costa broadly yellowish ochreous; fringes yellowish ochreous. Hind wings with dark discal dot and yellowish fringes. Underside whitish. Head, thorax, and abdomen glossy whitish.

Expanse of wings 26 millim.

Hab. Sikkim.

[The only specimens I have seen were taken by Möller's collectors in the interior.—*H. J. E.*]

Bapta griseola, sp. n.

♂. Fore wings iridescent white, thickly dusted with dark grey scales, with 2 dark grey transverse lines, one at $\frac{1}{3}$ outwardly curved and running vertically to the inner margin; the other at $\frac{2}{3}$, also outwardly curved, and slightly indented above the inner margin; extreme costa and fringes yellowish; a large black cell-spot. Hind wings the same, but without the first line. Head, face, and thorax white; abdomen white, freckled with grey. Underside dull iridescent white, without suffusion or markings of any kind.

Expanse of wings 36 millim.

Hab. Sikkim.

[Taken at Darjiling in August by me and by Mr. Knyvett in May.—*H. J. E.*]

ORTHOCABERA BRUNNEICEPS, sp. n. (Plate XXXI. fig. 23.)

♂ ♀. Resembles *O. sericea*, Butler, from Japan, but larger, with all the markings much more strongly expressed; head, face, and palpi all brown.

Hab. Sikkim.

[I have this from Messrs. Gammie and Knyvett, taken in spring, and one from Mr. Dudgeon marked February. Mr. Doherty took it in the Karen Hills in March. It seems to occur at about 5000–7000 feet. It is a very distinct, well-marked species.—*H. J. E.*]

MICRONIDIA (?) SUBPUNCTATA, sp. n. (Plate XXXI. fig. 11.)

♀. Fore wings silky white; costa speckled with brown striæ; 4 transverse pale olive lines; the second, as usual, the broadest, in the middle of the wing beyond the cell-spot, which is a distinct blackish dash; 4th line olive, parallel to hind margin, broader and more distinct than in *simpliciata*; 1st and 3rd very slender, the olive tints much interrupted, but marked on each vein by a black dot; the basal line preceded by 2 or 3 transverse dark striæ; a strong black basal line before the fringes, distinctly interrupted on the veins; fringes tinged with olive. Hind wings the same, but without the 1st line; the other 3 meet towards the anal angle, before which are 2 large black spots; inner margin also pale olive. Head and thorax white, tinged with pale olive; abdomen entirely pale olive. Underside white, with the costal striæ and cell-spot darker, the other markings showing through.

Hab. Sikkim. In these examples the antennæ are subserrate and ciliated; it is therefore probable that those of the ♂ will be found to be pectinated.

[I took one specimen myself at Tonglo and have two others from the interior, all females.—*H. J. E.*]

MICRONIDIA UNIPUNCTA, sp. n.

♀. Fore wings pure creamy white, with 4 straight pale olive-ochreous streaks. Costa with a few irregularly disposed dark striæ. The first line is nearer the base than in *simpliciata*, Moore; the second, the broadest, is *before* the middle of the wing, and includes the cell-spot, which is very faint and lies on the outside edge of the fascia; the 3rd is straight like the 2nd and not waved as in *simpliciata*; all these three run parallel to one another, slightly inclined outwards; the 4th band is narrower and parallel to the hind margin, therefore inclined at a slight angle to the 3rd; none of the 4 lines touches the costa; a fine black line at base of fringes, attenuated at the end of each vein. Hind wings without 1st line; 2nd and 3rd as in fore wings; 4th, edged distinctly with brown externally, runs from the *extreme* apex to before the anal angle; space beyond it to the hind margin whiter, containing only 1 black spot above anal angle; fringe-line very fine and interrupted. Head, face, thorax, and abdomen silky white. Underside all white, but with the markings of the upperside showing through.

1 ♀ from Darjiling the same size as the ♂ of *simpliciata*, Moore, which is smaller than the ♀.

[The only specimen I have seen was collected by Mr. Knyvett.—*H. J. E.*]

PLUTODES TRIANGULARIS, sp. n.

♂. Very closely allied to *P. costatus*, Butler, but larger; the yellow costal streak decidedly broader, with a much enlarged triangular central tooth; patch at the anal angle much broader; basal line brown at $\frac{1}{4}$, and vanishing in the yellow costal streak *before* the first small yellow tooth. (In *costatus* this line is at $\frac{1}{3}$ and runs up to the same yellow tooth.) In the hind wing the yellow patch at the inner angle is separated from the brown ground-colour by a nearly straight line, while in *costatus* the same is manifestly sinuous. Underside of both wings *yellow*, with a vinous tinge; an irregular purplish blotch towards the apex of both wings; the fore wings with an oblique purplish bar in the middle. The basal half of the patagia, as well as the collar, *yellow*.

Expanse of wings 46 millim.

Hab. Sikkim; Naga Hills.

[Seems rare in Sikkim, where I took one myself at 2300 feet in May, but is commoner in the Naga Hills.—*H. J. E.*]

ZAMARADA (?) MARGINATA, sp. n. (Plate XXXII. fig. 22.)

♂. Fore wings ochreous, with many fine transverse brown or greenish striæ; base of fore wing, costa, apex, and hind margin black-brown, with some chalybeous reflections; the costal streak is traversed by pale irregular striæ; a discal, dark-edged, somewhat sinuous ocellus, darker above, where it touches the costal streak; the dark marginal region is bounded by a very indistinct thickish 2nd line, which, starting from the costa at about $\frac{3}{4}$, forms a large outward curve, nearly touching the hind margin, and an obtuse projection at anal angle. Hind wings more thickly striated than fore wings, with a small, dark, discal spot, and the submarginal line running close to and parallel with the hind margin, the space between them being black-brown, with the chalybeous reflections stronger than in fore wings. Head, thorax, and base of abdomen black-brown, rest of abdomen ochreous. Underside pale greenish yellow, with a vitreous appearance; both wings with a broad black-brown marginal band. The discal spots on both wings distinct; the marginal band shows through on the upperside as a brownish smudge along the inner edge of the narrow dark border.

Expanse of wings 28 millim.

Hab. Naga Hills.

[Doherty sent one specimen only, taken at about 3000 feet in Sept.—*H. J. E.*]

Subfam. ABRAXINÆ.

OBEIDIA, Wlk. xxiv. p. 1139.

Type, *O. vagipardata*, Wlk.

OBEIDIA MILLEPUNCTATA, sp. n.

♂. Fore wings white, yellowish towards the base, with irregular clusters of small brown-black spots along the first half of the costa, at the apex, and along the hind margin; extreme apex and fringes wholly brown-black; at the middle of the costa is a large squarish patch, with 4 oblong smaller blotches below it, one on the median vein, the other 3 on the 3 median nervules, just beyond the origin of each; below these, on the inner margin, are 2 irregular brown-black patches. Hind wings white, with the apex and hind margin irregularly blotched and dotted; an interrupted central fascia, consisting of a quadrate dark blotch on the costa, and 4 smaller oval ones, on the submedian and 3 median nervules respectively, the 2 upper ones being contiguous. Underside the same. Head, thorax, and abdomen yellow, with the usual black spots.

Expanse of wings 48 millim.

Hab. Sikkim.

[Males of this species were taken by Möller's native collectors in the interior, but I have never seen the insect myself alive.—*H. J. E.*]

OBEIDIA FUMOSA, sp. n.

♂ ♀. Resembles *O. libellulalis* in size and shape; the costa varied with yellow for $\frac{2}{3}$ from the base; a series of irregular roundish costal spots, an interrupted submarginal row of spots, the discal spot, and another between it and the base, the hind margin broadly, and the inner margin more irregularly, smoky grey; hind wings the same, but without the basal spot; the spots on the fore wing often irregularly confluent. Underside the same as upper; abdomen yellow, with black dots. Distinguished from *O. libellulalis* by the absence of the yellow hind margins of the wings and the duller grey ground-colour of the markings.

Expanse of wings 70 millim.

Hab. Naga Hills.

[Seems not uncommon at 5000–6000 feet, where Doherty took several specimens.—*H. J. E.*]

PARICTERODES, gen. nov.

Abraxas?, Moore, P. Z. S. 1867, p. 653.

This new genus is necessary for the reception of *Abraxas* (?) *tenebraria*, Moore, and 3 or 4 other species. It resembles *Icterodes*, Butler, superficially, but is distinguished by the structure of the palpi and the coloration of the abdomen. The latter, instead of being yellow with black spots, as in the normal *Abraxinæ*, is concolorous with the hind wings. The palpi are porrected

forwards, slightly decumbent, with the 3rd joint distinct and pointed, whereas in *Icterodes* they are stout, short, and inclined upwards.

Type, *Paricterodes tenebraria*, Moore (*Abraxas*?).

PARICTERODES COMMIXTA, sp. n.

♂ ♀. Fore wings bronzy olive; if carefully examined, however, the ground-colour will be seen to be dull whitish, so thickly overlaid with ochreous and dull olive spots and strigæ, interspersed with blackish spots and shades, as to be itself almost obliterated. If viewed obliquely, the direction of the transverse lines and lighter spots becomes plainer. The basal $\frac{2}{3}$ of the wing is more or less overspread with blackish, especially towards the costa; in the outer $\frac{1}{3}$ can be seen 3 curved rows of black spots between the veins, running parallel to the hind margin, and between them, but fainter, similar rows of pale, slightly shining spots. These are much plainer in the ♂, especially along the submarginal line; fringe chequered, light ochreous and dark olive, with a basal row of black spots between the veins. Hind wings dull glossy grey, densely irrorated with darker grey, with a dull central spot and 2 indistinct dark curved lines; fringes dull ochreous, not chequered. Underside: fore wings blurred cinereous, darker along the costa, variegated with ochreous towards the hind margin and along the costa; hind wings of ♂ clear pale ochreous, thickly dusted with dark grey atoms, with the dark central spot and central fascia distinct; in the ♀ dull ochreous white, with the same markings indistinct. Head, antennæ, and thorax dark bronzy olive, like fore wings; abdomen ochreous, mixed with cinereous as in the hind wings.

Expanse of wings 56 millim.

Hab. Sikkim.

[This fine species is not uncommon at high elevations in the interior. I took it at Sundukpho about 12,000 feet, and my native plant-collector brought it from Jongri at 13,000–15,000 feet. It flies in July and August.—*H. J. E.*]

PARICTERODES LUCIGUTTATA, sp. n.

♂ ♀. Fore wings white, almost entirely suffused with olive-ochreous, which tint is especially thick along the veins towards the hind margin; 4 dark brown-black irregular fasciæ can be traced across the wings running parallel to the hind margin; the space between is dotted with minute white atoms of the ground-colour, the submarginal being followed by a more distinct and regular series; when viewed obliquely, all these white patches appear silvery bluish; costa between the dark lines ochreous, dotted with black; fringes chequered, light and dark olive-ochreous. Hind wings greyish ochreous, minutely dusted with dark atoms, with an indistinct dark central spot and 2 faint dark curved fasciæ; fringes chequered, but only darker at end of veins. Underside dull cinereous ochreous along the costa and hind margin. Hind

wings clear ochreous or ochreous white, with larger flecks of darker and with the central spot and middle band plain. Head, thorax, and abdomen concolorous with fore wings. Underside of abdomen like hind wings.

Expanse of wings, ♀ 52 millim., ♂ 48 millim.

Hab. Sikkim.

A smaller and paler species than *commixta*, distinguished by having the fringes of the hind wings chequered as in the fore wings, and by the silvery lustre of the pale spots.

[Not uncommon on the Nepal frontier from 10,000 to 12,000 feet, where I took it in June and July.—*H. J. E.*]

PARICTERODES (?) VIOLACEA, sp. n. (Plate XXX. fig. 12.)

♀. Fore wings olive-tawny, thickly dusted with dark brown atoms, with 4 transverse black-brown bands, all more or less geminated, the 1st and 3rd evidently so; the second includes the dark central spot; the 4th or submarginal consists of dark wedge-shaped blotches lying between the veins, each followed by a brighter, pale spot; a dark apical and subapical blotch beyond; fringes chequered brown or pale tawny, the dark spaces twice as broad as the lighter; a row of roundish black spots before the basal line. The transverse dark fasciæ are interrupted across the 3 submedian nervules, along which a distinctly clearer tawny patch runs from near the base to the hind margin. When viewed obliquely, the intervals between the lines and the paler spaces which divide their geminations are seen to be purplish violet. Hind wings dirty grey, with only a faint trace of central spot, and still fainter of a curved fascia. Underside: fore wings blurred cinereous, with only the extreme costa ochreous, spotted with darker; hind wings clear pale ochreous, thickly dusted with cinereous, with distinct blackish central spot and central fascia, this latter decidedly *angulated* in the middle. Head, thorax, and abdomen dark, mottled brown and tawny; the abdomen with less mixture of dark than the head.

Expanse of wings 38 millim.

Hab. Sikkim.

Possibly the ♀ of *Micrabraxas subolivacea* described later on.

[Two specimens taken at Sundukpho at about 12,000 feet by me in July; others from native collectors.—*H. J. E.*]

PERCNIA SUBMISSA, sp. n.

♂. Wings greyish white, with a slight pinkish tinge; spots as in *belluaria*, but reduced in size, and rounder, more dot-like; in the submarginal row the 3rd and 4th from the costa are nearer each other than each is to the one above and below; underside the same; abdomen white, with two black spots on each segment.

Expanse of wings 44 millim.

B. M., Dharmsala.

Hab. Sikkim.

[Not uncommon in April and May in the valleys of the interior.—*H. J. E.*]

PERCNIA INTERFUSA, sp. n.

♂. Fore wings greyish white, suffused at base, along the costa and the hind margin, with dark smoky grey; the spots all elongated; the first 3 costal spots enlarged into quadrangular blotches. Between the discal and submarginal row of spots is a row of grey wedge-shaped blotches, ending on the inner margin with 2 larger contiguous darker grey blotches; another and more suffused series of similar blotches before the hind margin; fringes grey. Hind wings purer white; the intermediate series of grey blotches much reduced in intensity; fringes white. Thorax and abdomen dark smoky grey, with 2 black spots on each segment; thorax, head, and base of fore wings tinged with dull ochreous olive. Underside like upper, but with less grey suffusion, except along costa and hind margin of fore wing, the latter of which is wholly dark grey.

Expanse of wings 60 millim.

Hab. Naga Hills.

[I have only seen the type of this, which was taken by Doherty at about 6000 feet in Sept.—*H. J. E.*]

METABRAXAS REGULARIS, sp. n.

♂. Fore wings dull white, traversed except on the disk by a succession of series of brown-grey spots and blotches; basal patch consisting of 3 interrupted lines of grey blotches, tinged with dull ochreous, followed by a 4th still more interrupted; cell-spot large, oval, leaden grey; followed by 6 sinuous series of grey blotches, more or less parallel to the hind margin; the 1st, 3rd, and 5th consisting of smaller, more detached spots, lying *on* the veins; the 2nd, 4th, and 6th of larger, more confluent blotches, lying *between* the veins; the 2nd forming a dark double spot on the inner margin. Hind wings whiter; the spots smaller; the 2nd series beyond the cell-spot absent. Underside like the upper. Head, thorax, and abdomen dull yellowish grey, with the usual spots black.

Expanse of wings 74 millim.

Hab. Naga Hills.

ABRAXAS METAMORPHA, sp. n.

♂. Wings white; fore wings with basal area yellow, more or less overrun with cinereous spots, followed at $\frac{1}{3}$ of the wing by a brownish fascia of irregular width and shape, but generally apocopated below the median; a central irregular, brownish fascia, running nearly parallel to hind margin, composed of confusedly confluent spots, almost touching on the inner margin the *sinuous* submarginal fascia, along the centre of which can be traced for $\frac{2}{3}$ of the distance from the inner margin a pale yellow line; the submarginal band is recurved backwards just before the costa, and followed on the costa by an irregular-shaped, somewhat triangular blotch, which at times unites with it a row of round black spots along the extreme hind margin, the space between these and

the submarginal band sometimes with only 1 or 2 round spots, sometimes with several more or less confluent ones. Hind wing with a central round spot; a row of spots along the abdominal margin, a fascia-form row of spots beyond the centre, and a series of spots along the hind margin itself. Head, thorax, and abdomen yellow, spotted with black.

The distinctness of the markings seems to vary much, more particularly in the hind wings; it might well be considered a fixed form of the common *A. grossulariata*, but the sinuous submarginal fascia with its central yellow streak will well distinguish it.

Hab. Sikkim.

This form, I believe, occurs also in Japan. In Mr. Elwes's collection is a single ♀, rather larger than the Sikkim specimens, and with the sinuous submarginal band entirely interrupted for a short distance just above the centre by the pale ground-colour, which interruption gives the specimen a decidedly different appearance, but the central yellow line is present as in the Sikkim insect.

ABRAXAS DIAPHANA, sp. n.

♂. Fore wings dull pale or dark fuscous, with darker irrorations, very faintly tinged with yellowish towards the base; an indistinct dark line near the base, forming in part or wholly the margin of a basal patch; a small dark cell-spot and an oblique dark fuscous line beyond, parallel in the main to the hind margin, but with a slight bend above the middle. Hind wings the same, but a little paler. Underside like the upper; abdomen concolorous. Head and thorax tinged with dull yellowish.

In the Atkinson Collection placed as a variety of *irrorata*, Moore.

Hab. Sikkim.

[It is possible that this is only an extreme alpine form of *A. irrorata*, Moore, occurring at high elevations. I have 6 specimens, varying considerably in tint, which were taken by my native plant-collector, Phoolsing, at Jongri, about 13,000 feet, whilst *A. irrorata* occurs at about 10,000 feet.—*H. J. E.*]

ABRAXAS SEMILUGENS, sp. n.

♀. Fore wings white, with a few yellow scales near the base; the whole wing densely suffused with dark fuscous dots and shading, which are thickest at the edge of the basal patch and beyond the 2nd line; cell-spot black and distinct. Hind wings rather less thickly speckled, especially towards the base. Head, thorax, and abdomen pale yellow, with black markings; the segments of the abdomen marked with black triangles. Underside like upper, but still darker in the fore wings; cell-spot of hind wings prominent.

Expanse of wings 35 millim.

Hab. Sikkim.

[I think that this may be a small dark variety of *A. picaria*,

Moore, though it certainly looks distinct. The latter species varies considerably, and some of the forms are intermediate between it and *A. semilugens*. The type was taken in September.—*H. J. E.*]

ABRAXAS ALPESTRIS, sp. n. (Plate XXX. fig. 15.)

♂. Fore wings straw-yellow, slightly deeper yellow at the extreme base, and paler in the centre; the whole ground-colour almost obliterated by the density of the fuscous-brown irrorations, which form two darker shades, one indicating the outside edge of the basal patch, the other the ordinary 2nd line; touching the latter is a large round dark cell-spot; fringe chequered brown and yellowish. Hind wings white, for $\frac{2}{3}$ from the base, sparsely sprinkled with dark dots, and with a central spot; outer third dusted like the fore wings, and separated from the whiter basal field by a thick dark fuscous curved line. Abdomen fuscous mixed with yellowish. Underside like upper, the dark markings more prominent.

Expanse of wings 28 millim.

[Four males of this distinct species were brought from Sundukpho, on the Nepal frontier of Sikkim, by one of my native collectors.—*H. J. E.*]

ABRAXAS NIGRIVENA, sp. n.

♂. Wings shining white, with all the veins delicately traced in black; fore wings with the extreme costa from base to middle black; extreme base orange, with a single black dot at the base, and 3 on the outside of the orange patch, situated on the subcostal, median, and submedian veins respectively; fringes white, short; top of head and thorax orange; the latter with a small black dot on each side near the base of the wing and (probably) 4 black dots on the top. Abdomen pale yellow, with a dorsal and two lateral rows of black spots, one on each segment; the underside with an elongate black dash on each segment, nearly touching the lateral spots; antennæ blackish. Underside of wings white; in the fore wing, with the subcostal and discal areas blackish.

Expanse of wings 30 millim.

Hab. Sikkim; also in Mr. Moore's collection.

[Taken by me at Tonglo and on the Nepal frontier from 10,000 to 12,000 feet in July.—*H. J. E.*]

ABRAXAS TRISERIATA, sp. n. (Plate XXXI. fig. 9.)

♂ ♀. Wings shining white, but with an ochreous tint; in the ♀, towards the costa and base, dull greyish; all the veins clearly delineated in black; costa of fore wing narrowly black to beyond the middle; basal patch pale yellow, with a black spot close to the base itself, and the outer edge marked with an irregular, discontinuous black curved line, preceded by a less distinctly expressed similar line in the patch; just beyond the middle a curved blackish shade, and halfway between it and the margin a fine curved line, both parallel to the hind margin; the outer of the

2 lines marked, where it crosses each vein, by a black dot. Hind wings the same, but without the yellow basal patch; fringes white, short. Head and thorax yellow; the latter with black spots. Abdomen straw-yellow, with dorsal, lateral, and ventral row of black spots. Antennæ blackish. Underside white, with the cell-spots conspicuously black, but without the transverse fasciæ; fore wing with costal and subcostal areas blackish. The markings in the ♀ are darker than in the ♂.

Expanse of wings 36 millim.

Hab. Sikkim.

[Taken in the interior by Möller's collectors, probably at a high elevation.—*H. J. E.*]

Subfam. Ennominæ.

PANISALA OLIVESCENS, sp. n.

♀. Ground-colour pale hoary grey, finely dusted with olive-brown atoms; a fine oblique straight basal line, parallel to the hind margin; median line parallel to it, from before the middle of the costa to before the middle of the inner margin, followed by a diffuse, olivescent shade, which fades into the ground-colour before the 3rd line, which starts from the costa halfway between the 2nd and the apex, is curved outwards, not inangulated, near its origin, and then runs back nearly straight, so as almost to touch the 2nd line on the inner margin; space beyond to the hind margin olivescent-brown, except below the costa, with a faintly paler submarginal fascia-form space. Hind wing like fore wing, but with no basal line, and with the 2nd and 3rd lines not nearly touching each other on the inner margin. Underside dull yellowish grey, lighter in the hind wings. Head, thorax, and abdomen pale whitish grey.

Hab. Sikkim.

Slightly larger than *P. truncataria*, Moore.

[Though the colour of this species is very different from that of *P. truncataria*, the pattern is the same. I have a male taken by Knyvett in April which matches the type female in colour. All my specimens of *P. truncataria* which are dated were taken in July and August, so this may be the early brood of it.—*H. J. E.*]

Hololoma, gen. nov.

Distinguished from *Panisala*, Moore, by the structure of the ♂ antennæ. In *Panisala* the lateral branches forming the pectination are simple, thin, long, and projected obliquely forwards; in *Hololoma* they are short and blunt, and stand out nearly at right angles with the shaft, each having 2 fine short cilia at the apex, and finely ciliated laterally, these ciliations giving a filmy appearance to the whole pectination. The apex of the hind wing is either plainly rounded off or very faintly incurved, without the deep excavation that occurs in *Panisala*.

HOLOLOMA LUCENS, sp. n.

♂ ♀. Ground-colour pale shining grey, sparsely sprinkled with short transverse brownish strigæ; a red-brown, slightly curved, basal line; a thick, straight, red-brown median line, starting just from the middle of the costa, and reaching the inner margin before the middle, running exactly parallel to the hind margin; 3rd line, starting from costa at $\frac{2}{3}$, is strongly curved outwards opposite the cell, and then runs straight obliquely inwards, becoming thicker as it nears the inner margin, where it nearly touches the median line; marginal region smoky grey, with a dark submarginal line, consisting of fine lunules between each vein. Hind wing without basal line, but with the thick red-brown median line, as in the fore wing, and 2 other red-brown lines beyond the middle, which are nearer one another at the apex than on the inner margin; a distinct dark cell-spot on both wings; fringes reddish brown. Underside bright ochreous, with deeper red-brown strigæ and lines; the costa itself pale grey. Head, thorax, and abdomen above pale grey; underside of abdomen broadly bright reddish ochreous, as in *patularia*, Wlk. The hind wings are slightly excised below the apex. Distinguished from *patularia*, by the larger size, paler ground-colour, distinct cell-spots, and the presence of 3 dark lines, instead of 2, in the hind wings.

Hab. Sikkim.

[Taken by Möller's collectors in June, but I do not know the exact locality.—*H. J. E.*]

DALIMA INTRICATA, sp. n.

♂. Fore wing pale ochreous, sparsely dusted with very minute black atoms, the extreme base and base of costa slightly yellowish; 1st line brown, angulated below the costa, then running obliquely to the inner margin, rather nearer the base than usual; central line brown, straight, parallel to hind margin, thickened a little at its costal end; this line stands just before the middle of the wing; beyond it is the small blackish cell-dot; exterior line brown, thicker on costa, forming an acute angle towards the apex, then curved inwards to the inner margin at $\frac{2}{3}$, where there are 3 black spots on its inner side, and 2 smaller beyond it; a black-brown oblique apical streak nearly touches the angle of the exterior line, is obsolete for a short distance, and then curves away much more indistinct to the inner margin before the anal angle; an indistinct denticulated subterminal line runs across this; beneath the oblique apical streak are 2 or 3 small brown lunules before the base of the fringes, which are themselves deep brown; the whole hind margin is slightly discoloured with pale olive. Hind wings coloured like the fore wings, with a straight brown line before the middle, followed by the small cell-dot, then a fine line, consisting of 3 curves convex inwards, and still another indistinct line, which is straight only before the costa; apex produced in a sort of tail; at the base of the fringes above it is one, and below it 2, small

dark lunules; fringes pale to below the tail, then brownish. Head, thorax, and abdomen all ochreous. Underside brighter ochreous, with coarser mottlings, and all the markings rather plainer, the 3 black spots being merged in one large one.

Expanse of wings 50 millim.

Hab. Bhotan.

[Besides the type, which was taken by Möller's collectors in August, I have three specimens from Bernardmyo, Burmah, taken by Doherty in May at about 6000 feet. They agree perfectly.—*H. J. E.*]

LEPTOSTICHIA, gen. nov.

Fore wings with costa very gradually curved till near apex, where it becomes strongly convex; apex bluntly produced; hind margin incurved just below apex, then oblique and straight to anal angle. Hind wings ample, with very round hind margins. Antennæ, ♂, beset with fascicles of fine cilia. Palpi short, thick, blunt, the 3rd joint very minute; tongue present. Legs long and weak; hind tibiæ with 2 pairs of spurs. Neuration:—Fore wings: 1st median nervule at $\frac{1}{2}$, 2nd at $\frac{7}{8}$, 3rd from lower end of cell, the median nervure between the 2nd and 3rd being inclined upwards; discocellular curved, starting from the upper radial at a short distance beyond the point where that nervule leaves the subcostal; lower radial from centre of discocellular; 1st subcostal nervule from the same point as the upper radial; 2nd a little beyond 1st; 4th and 5th at a similar distance beyond 2nd; 5th running straight to hind margin below apex; 4th curving into the apex itself; 3rd out of 4th shortly before apex. Hind wings: 2 subcostal nervules separating just before end of cell, so that the discocellular rises from the 2nd subcostal, as in the fore wings from the upper radial; median nervules as in fore wings.

Type, *Leptostichia latitans*, sp. n.

LEPTOSTICHIA LATITANS, sp. n.

♂. Fore wings liver-colour, suffused with dull olive, and tinged in parts with lilac-grey; 1st line indistinct dull olive, slightly darkened on costa and inner margin, where it is preceded by a few pale lilac scales; 2nd line at $\frac{4}{5}$, darker on costa, dull olive, edged indistinctly with grey, runs first outward, then obliquely inwards, to a little beyond the centre of the inner margin, where it is preceded by a round black blotch; to the inside of this blotch a central olive shade can be faintly traced from a darker spot in the middle of the costa; marginal area wholly dull olive, except a narrow grey space immediately before the fringes; space between the 2 lines overlaid with slightly paler grey scales. Hind wings redder, with a curved line at $\frac{2}{3}$, answering to the exterior line of the fore wings, and between that and the base a broad, straight, blackish shade. Head, thorax, antennæ, and abdomen all concolorous. Underside dull tawny-orange, sparsely flecked with rather coarse fuscous dots, with a larger discal spot in the fore

wings, and a blackish shade from the inner margin of the hind wings running $\frac{2}{3}$ across the wing. Fringes of both wings, above and below, chestnut.

Expanse of wings 60 millim.

Hab. Darjiling.

It is more than probable that the black spot on the inner margin of the fore wings is variable.

[This species, of which I have only the type specimen sent me by Mr. Knyvett and taken in March, is wonderfully like *D. patnaria*, Moore, in colour, but very different in the shape of the hind wings.—*H. J. E.*]

GONODONTIS, Hüb. Verz. p. 287.

Type, *G. clelia*, Cram.

GONODONTIS VINOSA, sp. n. (Plate XXXII. fig. 21.)

♀. Fore wings vinous-grey, tinged with fulvous towards the hind margin, and with many small dark brown transverse striæ, especially along the costa; 1st line dark red-brown, angulated below the costa, then running obliquely to inner margin; 2nd line double, thick, indistinct, parallel to the 1st; subterminal line dark brown-black, starting from the costa at the origin of the 2nd, running out towards the hind margin below the apex, and then obliquely to the inner margin, where it again meets the 2nd line; costal region generally greyer than the rest of the wing, especially before the apex; subapical region diffusely overrun with fulvous. Hind wings darker, more generally reddish; central line swollen in the middle, with a narrow lunular spot at end of cell, *without scales*. Hind margin still deeper red, with no fulvous suffusion. Head and thorax ashy grey; abdomen mixed with red. Underside pale ashy grey, with darker flecks; the 2nd line of the fore wings and the central one of the hind wings very distinct, red-brown as is the *lower* half of the inner line on the fore wings; the marginal area of the hind wings and the lower half of that of the fore wings clouded with reddish grey or brown; 2 small black blotches below the apex of the fore wings.

Expanse of wings 28 millim.

Hab. Sikkim.

Smaller than the other species of the genus, but with the characteristic excavation in the costa of the hind wings, and sinuosity in the inner margin of the fore wings.

[Sent by Möller's collectors without exact indication of locality. Evidently a rare species.—*H. J. E.*]

HYPOSIDRA ALBIPUNCTATA, sp. n.

♂ ♀. Fore wing dull purplish cinereous, with a slight olive tinge; 1st and 2nd lines and median shade all slightly curved, darker, and resembling shades, not lines; subterminal area paler grey, edged by the irregularly sinuous subterminal line; hind wings like fore wings with 2 darker bands; origin of lines on the costa of fore

wings and end on the inner margin of hind wings marked by minute white dots, the latter always conspicuous; hind margin of fore wing below apex occupied by a diffuse bronzy olive suffusion. Underside purplish grey, with the middle and 2nd lines, the discal spots, and a shade following darker.

Expanse of wings, ♀ 56 millim., ♂ 48 millim.

The largest species of the genus.

Hab. Sikkim.

[Taken by Möller in March and May, in the low valleys, where it seems a rare species.—*H. J. E.*]

FASCELLINA INORNATA, sp. n.

♂. Fore wings dull olive-brown, shaded with dark brown beyond the 3rd line, and dusted sparsely with dark brown striæ towards the base and inner margin; 1st line dark brown, obliquely sinuous, with some pearly silvery scales, which are plainest on the inner margin and on the veins; 2nd line thick, sinuous, running in the main parallel to the 1st line, and to the hind margin; an indistinct, oblique brown blotch from the costa beyond the origin of the 1st line runs to meet the 2nd line below the costa; 3rd line brown, sinuous, apparently double, with a pearly silvery thread up the centre, consisting of a series of curves, concave basewards between the veins; the line forms a sinus inwards at the centre, and outwards below the costa, before which it is recurved again basewards, and is followed on the costa by a silvery blotch; the line is followed on the inner margin by a patch of silvery scales, and some indistinct teeth of the same colour can be made out in the dark submarginal space; costal space between 2nd and 3rd lines dull tawny. Hind wings thickly beset with dark transverse striæ at the base, with a nearly straight double brown silvery-centred middle line, and a less distinct denticulated submarginal line. Head, thorax, and abdomen above dark olive-brown. Underside bright fulvous; the basal half of the costa paler; the hind margin cinereous; 2nd line deep fulvous from costa halfway across the wing; 3rd line marked by a diffuse edging of pearly scales in the upper half, by a fine silvery line in the lower. Hind wings with 2 curved red-brown lines, which do not approximate. Underside of abdomen and thorax fulvous.

Expanse of wings 36 millim.

Hab. Sikkim.

Akin to *F. chromataria*, distinguished by the absence of white spots, and the presence of the dull tawny patch below the costa towards the apex. The antennæ are much more densely and lengthily ciliated than they usually are in this genus.

[This type is from the Atkinson Collection. I have another like it from Möller; it is evidently a rare species.—*H. J. E.*]

FASCELLINA SUBSIGNATA, sp. n.

♂. Fore wings ashy grey, much suffused with dull olivaceous, and chequered with a few darker striæ; 1st line, dark olive, forms an

acute angle outwards, then runs sinuously inwards parallel to the hind margin, a pale grey triangular costal space beyond it; 2nd line, dark olive with a slightly paler edging externally, leaves the costa at $\frac{2}{3}$, forms a large blunt curve nearly touching the hind margin in the centre, and then runs inward to the inner margin at $\frac{2}{3}$; the costal space beyond it is paler grey; the whole central area between the 2nd line and the 1st line (except a narrow paler space just beyond this last) is dark olivaceous, as is the hind margin. Hind wings with basal half pale grey, flecked with short dark-olive striæ; central line straight, dark olive, followed by a pale slightly yellowish one; rest of the wing deep olive; fringes dark olive. Head, face, and thorax dark olive; abdomen and apex of the patagia paler. Underside: fore wings silvery grey, towards the inner margin yellowish, the dark olive space between the outer line and the central shade (which latter is not discernible above) represents very accurately the head and neck of a bird; the hind margin, a triangular costal blotch before the apex, and a large irregularly rounded blotch above the anal angle, are also olive-brown; the latter contains a yellow triangle at the anal angle, and the top of the bird's head is yellowish. Hind wings dull canary-yellow, freckled with black; a strong, thickly-scaled, double, brown central line, followed by a very slender curved one. Underside of abdomen and thorax dull yellow.

Expanse of wings 34 millim.

Hab. Sikkim.

Nearest to *F. plagiata*, Wlk. = *viridis*, Moore.

[This also seems a rare species, of which I have only two specimens without exact indication of locality.—*H. J. E.*]

GARÆUS DISCOLOR, sp. n. (Plate XXXII. fig. 19.)

♂. Fore wings pale fawn-grey, finely dusted with darker atoms, and tinged in places with dark fulvous; 1st line scarcely darker, angulated below the costa, and preceded by a slightly paler space; a small black dot on the median and submedian veins; central shade diffuse, brownish, angulated below the costa, as in the case of the 1st line; a small blackish cell-spot at the extremity of the angulation; exterior line starting from an oblique brown costal blotch, followed by a clear white one, angulated like the others, and dusted below the angulation by a row of black dots on the veins; subterminal line very indistinct, starting from a whitish subapical blotch and followed in the centre by a small dark blotch. Hind wings paler, with similar markings, the central shade being reproduced as a thickish black basal line, and the 2nd line appearing denticulate, followed by a darker shade, which renders the subterminal line more conspicuous; on the abdominal margin the 2nd line is broadly black edged with white. Underside silvery grey with the lines dark; with the base, the disk, and the hind margin of the fore wings and the hind margin only of the hind wings suffused with olive-fuscous. Head, thorax, and abdomen like the ground-colour; face and palpi brownish (? with grease).

Expanse of wings 28 millim.

Hab. Naga Hills.

[The type is unique, and was taken by Doherty at about 8000 feet in July.—*H. J. E.*]

ISCHALIS, Wlk. xxvi. p. 1749.

Type, *I. incaria*, Guen. (*Epione*).

ISCHALIS COLORATA, sp. n. (Plate XXXII. fig. 26.)

♂. Fore wings pinkish ochreous, but the ground-colour is almost wholly overrun by a suffusion of tawny, the pale interspaces being likewise dappled with spots of the same tint; no 1st line; exterior line at $\frac{4}{5}$ pale silvery lilac, nearly parallel on the whole to the hind margin, forming a small sinus outward below the costa, and a similar one inwards above the inner margin; this line is followed immediately by a dull olive-green fascia, which is succeeded by a paler, narrower, somewhat interrupted fascia of the ground-colour, beyond which the whole marginal area is tawny; the nervules beyond the exterior line are themselves marked with the same tint of silvery lilac, dotted in places with dark brown; the whole basal $\frac{1}{3}$ is dark tawny, divided on the costa by a small paler space; a narrow tawny blotch lies on the costa in the middle; cell-spot diffuse, roundish, dark brown. Hind wings like fore wings, but the basal area only dappled sparsely with tawny spots, with the commencement on the inner margin of an irregular rust-coloured line. Head, thorax, and abdomen ochreous suffused with tawny. Underside like upper, but more brightly coloured—the tints of ochreous, tawny, and green much more brightly contrasted.

Expanse of wings 48 millim.

Hab. Sikkim.

[Brought by my native plant-collector from Jongri in the interior, where he took it at 13,000 feet in September. I have seen one other specimen only.—*H. J. E.*]

PRIONODONTA, gen. nov.

Fore wings with costa slightly convex at base and before apex, slightly concave between; apex subacute; hind margin subdentate, with a decided elbow in the middle, beneath which it is oblique; anal angle distinctly expressed; inner margin visibly incurved just before it. Hind wings with costa outlined as in fore wings, shouldered before apex; hind margin dentate, the teeth at the end of the 2 subcostals and 3rd median most prominent. Forehead slightly protuberant; palpi horizontally porrect; 2nd joint broad, loosely scaled, 3rd much shorter, smooth, subconical; tongue present. Antennæ of ♂ more than half as long as fore wings, bipectinate, the pectinations themselves short and stout, pubescent, becoming gradually smaller, so that the apex is subdentate only. Fore tibiæ short, with a tuft of hairs beneath;

hind tibiæ longer, not thickened, with 2 pairs of short, stout, blunt spurs. Neuration:—Fore wings with cell half the length of wing; discocellular oblique, the lower half more so than the upper; 1st median nervule at $\frac{1}{5}$, 2nd just before lower angle of cell, 3rd from the angle; lower radial from the middle, upper radial from near the top of the discocellular; 3rd, 4th, and 5th subcostals on a common stem from upper angle of cell; 5th leaving at $\frac{1}{3}$, 3rd at $\frac{2}{3}$, 4th into apex; 1st and 2nd subcostals free. Hind wings with upper half of discocellular vertical, lower oblique; 1st median at $\frac{2}{5}$, 2nd at $\frac{4}{5}$, 3rd from lower end of cell, which is wedge-shaped; 2 subcostals branching just before the discocellular; costal and subcostal veins near the base, running for a short distance, closely approximate.

Type, *Prionodonta amethystina*, sp. n.

PRIONODONTA AMETHYSTINA, sp. n. (Plate XXXI. fig. 13.)

♂. Fore wings pale green and dull amethyst, with darker transverse flecks; basal patch dark brownish amethyst, its outer edge distinctly angulated in middle and edged with darker; the extreme base of the costa green; central space pale green, broadening along the costa and inner margin, constricted in middle opposite the angle of the basal patch, containing between the veins sundry small, irregular, semitransparent whitish patches; marginal area dull amethyst, edged internally by an irregularly dentate darker shade, which represents the 2nd line and curves outwards towards the anal angle, and containing a thick blackish oblique line from the anal angle to the greenish spot which occupies the apical region; all the veins, where they traverse the green spaces, deeper green. Hind wings similar, but with the central green space restricted and not reaching the inner margin; fringes concolorous with the green and amethyst sections of the wing. Head, face, and collar greenish; thorax and abdomen mixed fuscous and amethyst; antennæ, anal tuft, tibiæ, and tarsi ochreous, dotted with darker; femora and underside of abdomen mottled with fuscous and amethyst. Underside of wings the counterpart of upper.

Expanse of wings 42 millim.

Hab. Darjiling.

[I took two males of this fine species at Darjiling in July.—*H. J. E.*]

SPILOPERA, gen. nov.

Fore wings ample, costa gradually curved from base to apex; apex bluntly rounded; hind margin with slight elbow above middle at end of 3rd submedian, vertically straight above, obliquely below. Hind wings with rounded hind margins, with a scarcely perceptible projection at end of 3rd median. Palpi porrect, upcurved, reaching well in front of face; tongue present; antennæ laminated, thickened in ♂; hind tibiæ of ♂ not thickened, with two pairs of strong spurs.

Type, *Spilopera debilis*, Butler.

SPILOPERA UMBRATA, sp. n.

♂. Ground-colour pale straw, dusted with dark atoms; an irregular, curved, basal line, only distinct towards the costa, and not reaching the inner margin; a blackish costal blotch just beyond the middle; 2nd line starts just before the apex as a red-brown spot, forms another smaller one just below, and is just discernible as a faint curved brownish-grey shade, which vanishes before the inner margin; it is followed by another similar submarginal shade; fringe from apex to the central angle dark brown, preceded by a red-brown patch; a minute blackish cell-spot; hind wing with dark cell-spot, and 2 faint greyish parallel fasciæ beyond centre. Underside brighter straw-colour, with larger, stronger, reddish-brown freckles; distinct black cell-spots and strong submarginal fasciæ, the inner of the two broadly bright reddish brown. Abdomen straw-colour; face darker; collar and base of costa pale brownish.

Expanse of wings 32 millim.

[A single male taken at Margarita in Upper Assam by Doherty in May.—*H. J. E.*]

OPISTHOGRAPTIS MÖLLERI, sp. n. (Plate XXXI. fig. 12.)

♂. Wings straw-yellow, with a pale brownish line from before the apex of fore wing to the middle of the inner margin of the hind wing; on the costa itself this is dark brown, and is followed by a small brown spot at the extreme apex itself; a large semicircular chestnut-brown blotch on the discocellular, dark-edged internally on the convex edge, and externally emitting a fine brown spike along the radial; a red-brown quadrate costal blotch above it touching the top; 3 small brown dots on the costa near the base; a small brown dot at the end of the 2nd and 3rd median and 2nd subcostal nervules. Head, thorax, abdomen, and fringes all straw-yellow. Underside rather duller, with the markings reproduced; the hind wings with traces of a second dentate line towards the hind margin.

Expanse of wings 54 millim.

Hab. Sikkim.

The palpi in this species and in *O. ablunata*, Guen., are shorter than in the rest, and these insects will perhaps have to be removed to a separate genus.

[I have only seen two males of this fine and very distinct species, which my collectors brought from the interior.—*H. J. E.*]

OPISTHOGRAPTIS LONGIPENNIS, sp. n.

♂. Fore wings canary-yellow, faintly suffused with tawny, and with 2 oblique, parallel, reddish-tawny lines, one from $\frac{1}{3}$ of the inner margin to $\frac{3}{4}$ of the costa, the other from $\frac{2}{3}$ of the inner margin to the apex; fringes yellow. Hind wings very pale lemon-yellow, with a small dark cell-spot and faint traces of a curved submarginal fascia. Head and thorax canary-yellow; face and abdomen lemon. Underside yellowish straw-colour, mottled with tawny-brown spots; costal region of fore wings at base and 2nd line

rusty brown. In the hind wings the fascia is more distinct, and forms a single larger dark brown spot.

Expanse of wings 42 millim.

Hab. Sikkim.

The species is somewhat abnormal in appearance, and comes nearest to *O. ablunata*, Guen.

[A single specimen only, taken at a high elevation in the interior.—*H. J. E.*]

XENOGRAPHIA, gen. nov.

Fore wing with costa uniformly convex from base to apex; apex prominent, but not acute; hind margin curved; anal angle rounded; hind wings well rounded. Antennæ of ♀ filiform, of ♂ laminated, laterally flattened; palpi stout, short, upcurved in front of face; scaling smooth and fine.

Type, *X. lignataria*, sp. nov.

XENOGRAPHIA LIGNATARIA, sp. n.

♂ ♀. Fore wings straw-colour, with very fine darker freckles, the basal and submarginal areas suffused with pale brownish; 1st line brown, curved; a small dark cell-spot; exterior line dark brown, doubled, the inner running obliquely straight, the outer in a series of curves, concave outwards; towards the costa the two diverge, but are both recurved basewards to the costa; a broad oblique blackish-brown or brown streak from the apex, indistinctly produced as a finer line to the inner margin just beyond the other 2; a row of distinct round spots between the veins some distance before the hind margin. Hind wings straw-colour, with a dark cell-spot; 2 parallel, brown, slightly curved central lines; a row of spots as in fore wings; and a faint submarginal curved line before them. Underside straw-colour, much peppered with brownish, with all the lines distinct. Head, thorax, and abdomen all pale straw-colour.

Expanse of wings, ♂ 28, ♀ 36 millim.

Hab. Sikkim.

[Taken by myself at Tonglo and at other places by Möller's collectors from June to October.—*H. J. E.*]

AUZEODES, gen. nov.

Fore wings broad, triangular; costa convex in basal half, and again before apex, concave between; apex produced, bluntly falcate; hind margin gibbous, indented just below apex; anal angle square. Hind wings triangular, with the anal angle square, the inner angle rounded; hind margin almost straight. Palpi smooth, subascending; third joint very small, not reaching vertex; tongue present; antennæ (♂) setaceous, simple. Neuration:—Fore wing with cell *broad*; median nervules rising at $\frac{2}{5}$, $\frac{4}{5}$, and from the end of cell respectively; lower radial from the centre of the discocellular, upper radial from the upper angle of cell, whence also the 5th subcostal, which runs at first upwards close to the

common stem of the other 4 for $\frac{1}{3}$ of its length, then runs parallel to the upper radial to the hind margin some distance below the apex; the 4th, from just before the end of the cell, runs into the apex itself, the other 3 leaving it one after the other shortly before apex. Hind wings with ordinary neuration.

Type, *Auzeodes nigroseriata*, sp. n.

The only species of the genus strongly resembles, both in shape and scaling, the species of *Auzea*, Wlk.: but the absence of the radial to the hind wings distinguishes it from the Œnochrominæ.

AUZEODES NIGROSERIATA, sp. n.

♂. Fore wings shining wood-colour, thickly dusted with dull rusty scales, more especially along the inner and hind margins; costa slightly dotted with blackish; the only visible markings are an exterior series of 4 black spots, arranged in a slight curve from the centre to the inner margin at $\frac{4}{5}$, having above them (towards the costa) 2 more, pale grey, with darker centres, very indistinctly visible; immediately before the apex an irregular oblique black dash from the costa, with some pale grey scales on either side. Hind wings the same. Head, thorax, and abdomen all unicolorous. Underside without markings, entirely suffused with smoky brown.

Expanse of wings 40 millim.

Hab. Pegu.

HETEROMIZA, gen. nov.

Cimicodes, Moore, P. Z. S. 1867, p. 616.
Pseudomiza, Butler, Ill. Lep. Het. vii. p. 100.

Fore wings with costa gradually curved; apex produced shortly and *pointed*; hind margin concave just below apex, then broadly convex. Hind wings rounded, at the anal angle nearly square. Palpi not upcurved as in *Omiza*, but with the 2nd joint rising; the 3rd porrected forward, in a plane with the forehead, which is produced in front. Antennæ simple in both sexes. Hind tibiæ of ♂ thickened, and armed with expansible tufts of hairs.

Type, *H. castanearia*, Moore (*Cimicodes*).

HETEROMIZA CERVINA, sp. n. (Plate XXXII. fig. 8.)

♂. Fore wings fawn-colour with an olive tinge, with the costa and the space beyond the acutely-angled 2nd line paler and somewhat silvery; the rest rather tinged with brown; the whole wing finely dusted with dark atoms; 1st line fine, brown, internally pale-edged, subangulated below the costa, then running straight to the inner margin; a large, round, black-brown central spot; 2nd line fine, brown, starting from $\frac{2}{3}$ of inner margin, running straight towards the apex and nearly touching the hind margin below it, thence, at a very acute angle, running back straight to the costa at $\frac{2}{3}$: this line is externally edged finely with paler; subterminal line indicated only by some small blackish dots on the veins; fringes dark brown like the central field. Hind wings like fore

wings, but without the basal line. Underside ochreous-grey, with a reddish tinge, dusted with dark grey, and with the central spots and lines indistinctly darker. Head, thorax, and abdomen fawn-coloured.

Expanse of wings 30–34 millim.

Hab. Sikkim.

Very much like *H. castanearia*, Moore, but smaller and paler.

[One ♂ taken by Mr. Gammie near Mongpo, and a much larger female by Mr. Knyvett in June; evidently a rare species.—*H. J. E.*]

LEPTOMIZA, gen. nov.

Fore wing: costa convex; apex slightly falcate; hind margin elbowed at the end of the 3rd median nervule, the lower half straight, oblique; the upper simply concave or with an intermediate tooth. Hind wings rounded with an elbow, as in fore wings. *Male antennæ simple*; palpi *porrect*, the terminal joint conical, drooping. Neuration normal. Hind tibiæ of ♂ *not* thickened.

Type, *Leptomiza calcearia*, Wlk. (*Hyperythra*).

LEPTOMIZA (?) ANOMALA, sp. n.

♀. Fore wings dark ashy grey, tinged with chocolate and dusted with irregular dark atoms; basal line indistinct, consisting of several black dots, forming an angulated line; 2nd line brown-black, starts from ¾ of the inner margin, runs straight towards the apex, before which it forms a *blunt* angle, and is recurved on to the costa; throughout its course it is finely edged with paler; above the inner margin it is preceded by a roundish and followed by an irregular-shaped blackish-brown blotch; a dark-edged, whitish-centred ocellus at end of the cell, and a dark spot on the costa *beyond* it; submarginal space, from apex to elbow, chocolate-tinged; below, ashy; above anal angle, an indistinct fulvous patch. Hind wings like fore wings; the cell-spot smaller, and the pale edging of the 2nd line paler. Underside of both wings fulvous, towards the inner margin whitish, coarsely variegated with black striæ; central spots large; lines indistinct, but the subterminal line shown by a row of black dots. Head, thorax, and abdomen concolorous, the latter paler beneath.

Expanse of wings 32 millim.

Hab. East Pegu, 4500 feet, April (*Doherty*).

LEPTOMIZA STRAMINEA, sp. n.

♀. Fore wings pale yellowish, dusted irregularly with tawny and fuscous atoms; 1st line very indistinct, brownish, running obliquely outwards to the subcostal, where it is angulated obliquely, then inwards to inner margin, forming a small brown dot on each vein; 2nd line from ⅘ of inner margin, double, runs obliquely to apex; the outer edge nearly straight to just before apex, where it is acutely deflexed to costa; inner edge, more irregular, forms a slight tooth on the 2nd and 3rd median nervules, opposite which the

included space is broader; likewise deflected to the costa before the outer arm, the inner deflection being twice as long as the outer; a brown-edged round ocellus in the disk; the 2 edges of the 2nd line are dark brown, and the included space deep tawny; hind margin shaded with fulvous. Hind wings like fore wings, with a straight, brown-edged, tawny band, broader, and with its outer edge angulated towards the costa. Underside more thickly and coarsely dusted with fuscous dots, and showing on both wings an irregularly zigzag submarginal row of black dots on the veins, which towards the costa of the fore wings develop into a sinuous submarginal line. Head, thorax, and abdomen sandy yellow.

Expanse of wings 36 millim.

Hab. Sikkim; Bhotan.

The ♂ being at present unknown, the reference of the species to *Leptomiza* is only doubtful.

[A male taken by myself at Cherra Punji in the Khasias in September, and another from the Karen Hills, show that Mr. Warren's generic determination is correct. The species, though so wide-ranging, seems rare in all localities.—*H. J. E.*]

LEPTOMIZA FUSCOMARGINATA, sp. n.

♀. Fore wings rather bright yellowish ochreous, irrorated with coarse fuscous atoms; basal line dark brown, bent on the subcostal, thence vertical; cell-spot round, diffuse, brown, with a minute pale centre; 2nd line black-brown from close to apex to before the anal angle, finely edged externally with lilac-white, and preceded by a dark-brown shade, the inner edge of which is irregularly scalloped; 2 small dark brown costal spots before it; marginal area wholly blackish-brown, with a slightly paler patch below the elbow; fringes brown-black, with faintly paler interspaces. Hind wings like fore wings, but with no basal line. Head, thorax, and abdomen yellowish straw-colour, dusted with darker; the segments of the abdomen with pairs of dark dots. Underside duller throughout, the lilac outer line dotted with blackish on the veins.

Expanse of wings 32 millim.

Hab. Darjiling.

[Taken in July by myself at 7000 feet.—*H. J. E.*]

OMIZA MUSCICOLOR, sp. n. (Plate XXXII. fig. 25.)

♀. Fore wings pale mouse-colour, slightly tinged with ochreous olive; no actual lines, their places being taken by mere change of tint; 1st very indistinct at $\frac{1}{3}$, parallel to hind margin to just before the costa, where it is recurved basewards; 2nd, from $\frac{2}{3}$ of inner margin, runs obliquely and slightly wavy towards apex, before which it appears to be, like the 1st, retracted basewards; space between the lines filled up with ochreous olive, and with a darker, slightly tawny shade beyond the discoidal spot, which is paler; space beyond 2nd line paler, somewhat pinkish, with an olive shade down the centre; fringes also olive. Hind wings a little paler than fore wings, and sparsely sprinkled with black

atoms; a darker fascia across the middle of the wing, olive-ochreous, followed by a paler space edged with pinkish and black. Underside pinky ochreous, speckled with black atoms; the inner margin of the fore wings, the apex, and the edge of the 2nd line pinky grey. Hind wings rather richer ochreous, with a yellowish fascia beyond the centre, which between the 1st and 2nd and 2nd and 3rd median nervules contains a semitransparent oval white ocellus strongly edged with deep brown. Head, antennæ, thorax, and abdomen all pinky mouse-coloured.

Expanse of wings 32 millim.

[A single ♀ from the Karen Hills, taken by Doherty in April at about 4500 feet.—*H. J. E.*]

AMORPHOZANCLE, gen. nov.

Fore wings with costa rather strongly arched throughout; apex rounded, blunt; hind margin below the broadly rounded apex oblique and slightly concave, anal angle well marked. Hind wings triangular, with both angles bluntly rounded off and hind margin nearly straight. Palpi minute, slender, not projecting beyond face; tongue present; antennæ of ♂ broadly pectinated. Neuration:—Discocellular of fore wing angulated; radial from the angulation; last subcostal from upper end of the cell (one of the subcostals appears to be missing).

Type, *A. discata*, sp. n.

AMORPHOZANCLE DISCATA, sp. n. (Plate XXXII. fig. 23.)

Fore wing pale liver-colour, darker at base and along costa, with sparingly scattered black scales, which form a black costal blotch at about ⅓; an oblong-oval whitish discal blotch, beyond which there comes a trace of a faintly darker shade; fringe short, vinous. Hind wings yellow ochreous, with black dusting. Head, thorax, and abdomen liver-colour, with darker atoms. Underside with all the tints brighter and more distinct.

Expanse of wings 28 millim.

One male from Naga Hills.

PLAGODIS RETICULATA, sp. n.

♀. Fore wings pale ochreous, traversed from base to hind margin by fine, interlacing, vertical, brown lines; costa brown from base to middle; a linear brown vertical cell-spot; inner margin rather paler, but dusted sparsely with rather large black shining scales. Hind wings with the costa pale, unstreaked; the anal angle darker, otherwise like the fore wings; no trace of lines or shades. Head, thorax, and abdomen straw-colour, with browner mottlings. Underside like upper, with both cell-spots clearer.

Expanse of wings 34 millim.

Hab. Sikkim. Also in Mr. Moore's collection.

[Taken by Möller in October at about 7500 feet, and by Knyvett in June. It seems, however, a local species in Sikkim, as I have never seen it myself.—*H. J. E.*]

ACHROSIS QUADRARIA, sp. n.

♀. Fore wings yellowish ochreous, tinged with fulvous; towards the base and apex with traces of 2 blackish transverse lines, which are each represented by a blackish blotch on the costa, and 2 round blackish spots on the inner margin placed obliquely one over the other; below the first costal blotch is a smaller blackish dot. Hind wings tawny yellow, with a composite blackish blotch at the anal angle and a blackish spot in the angle of the hind margin. Head absent; thorax and abdomen concolorous. Underside fulvous yellow, without markings.

Expanse of wings 36 millim.

Hab. Bhotan.

[A very fresh ♂ from Sikkim, sent by Möller, agrees exactly in the markings, but has the colour of fore wings brighter.—*H. J. E.*]

PRIONIA OBLIQUILINEATA, sp. n.

♂. Fore wings pale liver-colour, tinged with olive towards the base and irrorated throughout with reddish-brown atoms; 1st line at $\frac{1}{3}$ starts from the costa as a reddish-brown, outwardly oblique, short blotch, then runs obliquely inwards with an irregularly sinuous course; 2nd line, also red-brown, runs straight from the inner margin, shortly before anal angle, to the apex, just before reaching which it is deflected and forms a curved, oblique, costal blotch; extreme apex with a small blackish blotch and another shortly before it on the costa. Hind wings as in *squalidaria*, Hüb. Head, thorax, abdomen, and antennæ concolorous. Underside wholly dull orange-tawny, with a small blackish costal dash before the apex of *both* wings, and a distinct blackish cell-spot on the fore wings.

Expanse of wings 28 millim.

Hab. Naga Hills. Distinguished from its allies by the straight, distinct, second line.

[Doherty sent only one male of this, which was taken at about 4000 feet.—*H. J. E.*]

EURYTAPHRIA, gen. nov.

Fore wings ample; costa curved at base and before apex, which is distinct; hind margin entire, obliquely curved. Hind wings ample, with well-rounded hind margin, faintly indented opposite the cell. Palpi shortly rostriform; tongue present. Antennæ of ♀ simple, of ♂ pectinated; the pectinations fine, distant, and nearly at right angles with the shaft; legs moderate, hind tibiæ not thickened, with two pairs of spurs. Neuration:—Fore wing: first subcostal nervule anastomosing with the costal; the other 4 subcostal nervules on a common stem, which starts at $\frac{3}{4}$ of the cell, at which point the subcostal itself is bluntly angulated; the 4th subcostal nervule runs into the apex, the 2nd and 3rd being given off from it at $\frac{1}{2}$ and $\frac{3}{4}$ respectively, the 5th at $\frac{1}{4}$; the first median nervule starts at $\frac{3}{4}$, the second just before the lower end of cell where the median vein is inclined upwards, the third from the end; lower

radial from above the middle of the discocellular ; upper radial from the end of cell ; as a result of the ends of the subcostal and median nervules being inclined towards one another, the cell is very distinctly wider at $\frac{3}{4}$ than at its extremity. Hind wings with the discocellular angulated, the upper half vertical, the lower oblique ; the two subcostal nervules separating shortly before the end of the cell.

Type, *Eurytaphria undilineata*, sp. n.

EURYTAPHRIA UNDILINEATA, sp. n.

♂ ♀. Wings dark pinky grey, more or less suffused with pale tawny, and dusted with fuscous and black atoms. No distinct first line ; the second line starts at $\frac{1}{4}$ of the costa, runs outwardly oblique to the upper radial, where it forms a minute tooth, then describes a large sinus parallel to the hind margin, and curves inwards to the inner margin shortly before the anal angle ; the sinus is connected with the hind margin by 2 wedge-shaped streaks, and the lower part of the line above the anal angle appears to be geminated ; a small blackish cell-spot ; disk suffused with pale tawny ; costa and hind margin most thickly sprinkled with fuscous strigæ. Hind wings like fore wings, with black discal spot and an indistinct denticulated black line halfway between it and hind margin ; fringes concolorous, with a blackish basal line.

The above description is taken from a ♂ ; in the ♀ there is no tawny suffusion ; the mottlings are black instead of fuscous, and the second line only visible towards the anal angle ; the basal line of the fringes is represented by a series of black spots and dashes, and the cell-spots on both wings are black and therefore more distinct. Underside of both wings paler grey, mottled with darker, with the cell-spots and outer line showing through.

Expanse of wings, ♀ 36, ♂ 34 millim.

Hab. Sikkim.

Subfam. SELIDOSEMINÆ.

ANAGOGE (?) ALBIPICTA, sp. n.

♀. Fore wings dark fuscous, with a few indistinct, scattered, ochreous, transverse strigæ ; basal line darker, edged internally with paler ; a dark discal spot ; exterior line darker, interrupted in the centre and edged externally by a rather distinct pale ochreous line ; submarginal line indistinct, except in the centre opposite to the interrupted portion of the 2nd line, where it is indicated by a pale blotch ; extreme hind margin with pale vertical strigæ ; fringes brown. Hind wings like fore wings, but somewhat duller ; the exterior line without the whitish edges. Underside duller, with all the markings reproduced. Abdomen cinereous. Head wanting.

Expanse of wings 28 millim.

Hab. Sikkim.

The hind margin of fore wings is regularly curved, not bent above the anal angle.

[Taken at Jongri, 13,000 feet, by my native collectors.—*H. J. E.*]

ANAGOGE (?) CONCINNA, sp. n.

♀. Fore wings whitish ochreous, which ground-colour, however, is almost wholly hidden by a suffusion of tawny and brown and a chequering of narrow, transverse, olive-fuscous striæ; basal line darker, curved, broadly blackish on the costa, slightly edged with paler internally; exterior line blackish sinuous, followed by a pale costal spot and paler points on the veins; an elongate black cell-spot, with a black costal spot above it; submarginal line indistinct, sinuous, followed towards the inner margin by an irregular double blotch of the pale ground-colour; fringe clearly chequered light and dark, and preceded by a very clear, pale, basal line; the space between the cell-dot and the submarginal line is most deeply suffused with tawny fuscous. Hind wings dull straw-colour, very thickly mottled with cinereous, with a dark grey central dot and an indistinct dark grey subdenticulate line at $\frac{2}{3}$; fringes as in fore wings. Head, face, antennæ, and collar brown-black; thorax and abdomen mottled with fuscous, as the fore wings. Underside tawny ochreous-red, mottled with cinereous; the fore wings greyer than the hind wings; cell-spots and the transverse lines distinct, that on the hind wings especially dark, much clearer than on the upperside.

Expanse of wings 30 millim.

Hab. Darjiling.

This species will probably have to be separated and form the type of a distinct genus. The ♂ will throw light upon it. In the ♀ the palpi are remarkably short; the hind margin of the fore wing is not scalloped, but distinctly bent in the middle.

ANAGOGE (?) COSTINOTATA, sp. n.

♂. Fore wings fawn-coloured, darker on the disk, greyer towards the hind margin; a small, pale, yellowish, triangular blotch on the costa at $\frac{5}{6}$; costa itself with dark minute strigæ; fringes darker; a small dark cell-spot. Hind wings paler, with dark cell-spot and indistinct, curved, dark submarginal line. Head, thorax, and abdomen concolorous. Underside paler, with the cell-spots dark.

Expanse of wings 26 millim.

Hab. Bhotan.

[Taken by Möller's collectors in September only.—*H. J. E.*]

ANAGOGE LIGNICOLOR, sp. n.

♀. Fore wings ochreous, suffused with yellowish and tawny brown, and thickly strewed with transverse black striæ; 1st line at $\frac{1}{3}$ indistinct, indicated on costa by a dark spot; 2nd line at $\frac{2}{3}$ irregularly dentate, with three prominent teeth, one subcostal, and a pair in the centre; this line is preceded by a dark tawny suffusion and followed by a paler tawny one, which reaches to the submarginal shade, which is irregularly sinuous and whitish; fringe chequered dark and light tawny, with distinct yellow basal line; costa with yellowish patches. Hind wings like fore wings, but duller, and with only a faint repetition of the 2nd line; in both

wings a blackish discal spot. Head, thorax, and abdomen mottled, tawny and grey. Underside pale straw-colour, mottled with yellow, with the discal spots and lines darker and distinct.

Expanse of wings 32 millim.

Hab. Sikkim.

[Taken by me in August at about 7000 feet.—*H. J. E.*]

ANAGOGE RUFA, sp. n.

♀. Fore wings dull reddish testaceous, with three dark fuscous transverse lines, all running parallel to the hind margin; 1st at $\frac{1}{3}$, indistinct, wavy; 2nd a little before $\frac{2}{3}$, wavy, diffuse, followed in one example by a broadish, diffuse, fuscous shade; 3rd subterminal, more sinuous, consisting of a series of subcontiguous dark blotches; fringes concolorous, with a series of small, inconspicuous, dark dots at base; a large fuscous cell-spot. Hind wings whitish testaceous, with dark cell-spot and 2 faint dark lines towards the hind margin; fringes as in fore wings. Head and thorax reddish; abdomen like hind wings. Underside of fore wings like upperside of hind wings, except towards the apex where they are like the upperside; underside of hind wings like upperside of fore wings, with all the markings much clearer than above.

Expanse of wings 38 millim.

Hab. Sikkim.

ANONYCHIA, gen. nov.

Nadagara, Butler, P. Z. S. 1883, p. 172.
Onychia, Moore, Lep. Coll. Atk. p. 279.
Cidaria, Warr. P. Z. S. 1888, p. 330.

Type, *A. grisea*, Butler (*Nadagara grisea*, Butl.).

Under the generic term *Onychia*, Hübner in the 'Verzeichniss', p. 331, placed together the two species *mæniata*, Scop., and *peribolata*, Hüb., both of which belong to the subfamily *Hydriomeninæ*. Mr. Moore, in his Descr. Lep. Coll. Atk. p. 279, employs *Onychia* for his two new species, *lativitta* and *violacea*, which are, as he states, congeneric with Mr. Butler's so-called *Nadagara grisea*. All three belong, not to the subfamily *Hydriomeninæ* at all, but to the very different subfamily *Selidosemineæ*, in which there is no true radial to the hind wing, and are closely allied to the genus *Anagoge*, Hübn.

For this group I propose to slightly alter the name employed first by Hübner, and misapplied by Moore.

It is only fair to add that in the Society's 'Proceedings,' 1888, I myself wrongly referred one of the species of this genus to *Cidaria*, Tr.

ANONYCHIA ROSTRIFERA. (Plate XXXII. fig. 3.)

Cidaria rostrifera, Warr. P. Z. S. 1888, p. 330; Swinh. Cat. No. 3868 A.

CHIASMIA STRIGATA, sp. n. (Plate XXXI. fig. 22.)

♂ ♀. Fore wings whitish ochreous, thickly sprinkled with short,

dark, transverse striæ; discal spot dark fuscous, large, diffuse; costa with 3 indistinct dark blotches; the first near the base, representing the origin of the first line; the second above the discal spot; the third halfway between the second and the submarginal line; from this a curved series of small blotches can be traced, curving in beneath the discal spot; these blotches represent the 2nd line; submarginal line represented by a series of dark fuscous blotches, more or less wedge-shaped externally, and interrupted between the 2nd and 3rd median nervules; opposite these blotches, except at the extreme apex, the hind margin itself is likewise blotched with fuscous; fringes dark fuscous, chequered with paler and broadly pale opposite to the interruption of the submarginal line; a row of shallow, dark fuscous crescents at base of fringes. Hind wings slightly tinged with yellowish, with same markings as fore wings, but with a small discal spot; the fringes paler. Underside like upper, but somewhat duller. Head, thorax, and abdomen ochreous, dusted with darker. Antennæ fuscous.

Expanse of wings, ♂ 26, ♀ 24 millim.

Hab. Sikkim; Naga Hills.

LOXASPILATES, gen. nov.

Fore wings elongate; costa gradually arched; apex produced, pointed, especially in the ♂; hind margin obliquely curved. Hind wings rather short, with rounded hind margin. Antennæ simple in both sexes; palpi short, porrect; tongue present. Neuration as in *Aspilates*; transverse lines parallel to hind margin.

Type, *L. obliquaria*, Moore (*Aspilates*).

LOXASPILATES DISPAR, sp. n. (Plate XXX. fig. 14.)

♀. Fore wings light wood-brown, with the 3 markings dark brown; 1st line at $\frac{1}{3}$, slightly dentate; 2nd a little before $\frac{2}{3}$, also slightly dentate; both parallel to hind margin; a dark discal spot between them; subterminal line more irregular, forming 2 slight curves; fringes concolorous with wings. Hind wings pale dull grey, with a testaceous tinge; an indistinct dark cell-spot, and traces of 2 darker lines on the inner margin. Underside rusty ochreous; the fore wings with the lines indistinct, with a darker brown subapical costal blotch; hind wings with 2 distinct curved dark fasciæ: both wings with the cell-spot distinct. Head and thorax concolorous with fore wings, abdomen with hind wings.

Expanse of wings 36 millim.

Hab. Sikkim.

PARASYNEGIA, gen. nov.

The insects of this genus have hitherto been confounded with those of *Anisodes*, Guen., to which they have a considerable superficial resemblance. They have, however, no radial in the hind wings, and are closely related to *Synegia*, Guen., and *Halassa*, Butler. From both of these genera *Parasynegia* is separated by

the male antennæ, which are amply pectinated, whereas in *Synegia* the pectinations are very fine and short: and in *Hadassa*, though longer, yet stiff and straight. The neuration is the same as in those genera, and equally strongly marked.

Type, *P. pluristriaria*, Wlk. (*Anisodes*).

PARASYNEGIA COMPLICATA, sp. n.

♂. Fore wings yellow, with rusty specklings; first line dull brownish, acutely angulated before the discal spot, and more bluntly above the inner margin; basal region brownish; from ⅓ of the inner margin a brown line runs obliquely outwards, followed by another finer and more irregular one, the two curving round to the costa at ⅔; a fine brown subterminal line runs near the hind margin, parallel to it from the inner margin to the middle, where it stops short at a horizontal brown blotch from the exterior line to the hind margin; a similar subcostal blotch occurs higher up, which throws off an oblique darker streak into the apex. Hind wings similar, but with 5 transverse lines; one thick, red-brown, close to the base; a second, finer, just before the small dark discal spot; a third, like the second, beyond the spot; the fifth, thick and dark, from the inner angle to the anal angle, throwing off a dark blotch in the middle; these 4 all parallel to one another; the fourth is only a rusty, irregularly-undulating line, brown only at its origin at the costa, where it is followed by a brown spot. Face and collar red; antennæ and fillet white; front of thorax rusty; thorax and patagia, as well as abdomen, yellow. Underside pale straw-colour, with the markings dull brownish.

Expanse of wings 36 millim.

Hab. Naga Hills.

PARASYNEGIA SUFFUSA, sp. n.

♂. Fore wings yellow, thickly irrorated and suffused with rusty confluent atoms; an indistinct, angulated first line; a double, thick, grey-brown, oblique line from the middle of the inner margin to the apex, beyond which is a curved series of paler, sometimes clear yellow spots: sometimes the oblique lines are lost, and the discal space is more or less entirely overrun with leaden grey; a grey horizontal blotch to the hind margin in the centre, and another below the apex. Hind wings similar, with 4 irregularly-margined, parallel, leaden grey lines, the space immediately beyond the first line, which is close to the base, paler; in one case the first 3 lines of the hind wings are wholly obsolete; both wings have a distinct black cell-spot. Face, palpi, and collar deep rust-colour; antennæ and fillet yellowish; thorax and abdomen yellow, tinged with rusty. Underside pale straw-colour, with the dark markings reproduced, dull brown.

Expanse of wings 26 millim.

Hab. Naga Hills.

[Seems fairly common at low elevations in the Naga Hills.—*H. J. E.*]

ERINNYS, gen. nov.

Fore wings with costa straight, hardly convex before apex, which is slightly subfalcate; hind margin indistinctly crenulate, more oblique below the centre than above; hind wings subcrenulate, with a slightly more prominent tooth at end of 1st subcostal and 1st median nervules. Antennæ simple in both sexes, slightly thickened in ♂ towards base; palpi obliquely ascending, 3rd joint shorter than 2nd, horizontally porrect; tongue present. Hind tibiæ of ♂ thickened and flattened laterally, with 2 pairs of short, stout, spurs. Hind wings of ♂ with a small fovea close to base in the cell, which is visible above as a small dark raised patch.

Type, *Erinnys combusta*, sp. n.

ERINNYS COMBUSTA, sp. n.

♂. Fore wings ochreous, suffused with yellow and tawny and thickly sprinkled with black atoms; inner line indicated by 2 small black-brown blotches, one below, the other above the median; a small black-brown cell-spot; exterior line sinuous, black-brown at $\frac{4}{5}$, more or less parallel to hind margin; marginal area dark fulvous brown, except a slightly paler patch above the anal angle; fringes yellowish straw, dotted with black at end of all the veins, and entirely black opposite the cell. Hind wings in the main similar, but the basal half suffused with fulvous, and bounded, before the middle, by an irregularly dentate dark line, beyond which the wing is strikingly whitish. Head, thorax, and abdomen straw-colour mixed with tawny. Underside like upper, but brighter; the light and dark tints more contrasted.

Expanse of wings 30 millim.

Hab. Sikkim.

Superficially reminding one of *Garæus*.

HETEROSTEGANIA, gen. nov.

Anisodes, Moore, Lep. Coll. Atk. p. 250.
Stegania, Moore, Lep. Coll. Atk. p. 260.

Allied to *Stegania*; but easily distinguished. Fore wings longer; costa slightly arched, apex obtuse; hind margin oblique, curved; hind wings rounded, slightly protuberant in the middle of the hind margin, and with the anal angle square. Antennæ in ♀ simple, filiform; in ♂ thickened, slightly pubescent; palpi short, horizontally porrect.

Type, *H. lunulosa*, Moore (*Anisodes*).

HETEROSTEGANIA NIGROFUSA, sp. n.

♂. Fore wings wood-colour suffused with tawny, and sparsely dusted with coarse black atoms, a broad central fascia filled up with pale tawny, with a still paler patch just below the median; the inner edge of this fascia consists of a series of small curves

concave basewards, the outer of a similar series of curves concave outwards, and forming a sharp tooth below the costa, and a bilobed projection on the 1st and 2nd median nervules, containing a black blotch; discal spot small, blackish; a sinuous short blackish streak from the apex, its base connected with the tooth of the outer edge of the central fascia by a longitudinal tawny stripe; the costa from the base to the central fascia, a small blotch near the base on the inner margin, and some irregular clouds along the hind margin tawny. Hind wings the same, but with a small dark blotch on the *inner* edge of the central fascia, and none at all on the outer; discal dot hardly visible; no apical streak. Underside like upper, but duller. Head, thorax, and abdomen concolorous.

Expanse of wings 38 millim.

Hab. Sikkim.

[I have only seen a single male, which was taken in the interior by Möller's collectors.—*H. J. E.*]

Subfam. EUBYJINÆ.

Fam. *Amphidasydæ*, Guen. Phal. i. p. 191.

EUBYJODONTA, gen. nov.

Allied to *Eubyja*, Hübn., but differing in the outline of the wings and in the structure of the ♂ antennæ. These are stoutly pectinated for $\frac{3}{4}$, then simple; each pectination is stiff and bristly, nearly at right angles with the shaft and finely ciliated along its whole length, giving a filmy appearance to the whole antennæ. Tongue weak; palpi hardly visible. Fore wings elongate, narrow; the costa being nearly twice as long as the inner margin; costa itself nearly straight, curving only just before apex; apex rounded, broadly blunt; hind margin very oblique, twice concave, with a slight prominence between the 2 concavities between the ends of the 2nd and 3rd median nervules. Hind wings with 2 concavities, the intervening prominence being greater and rounded.

Type, *Eubyjodonta falcata*, sp. n.

EUBYJODONTA FALCATA, sp. n.

♂. Fore wings white with an ochreous tint, thickly sprinkled with irregular black flecks which in parts become confluent into blotches; the lines indicated by olive-tawny blotches; basal line represented by a curved tawny fascia broad on the inner margin, and not reaching the costa, followed on costa and inner margin by a black blotch; 2nd line, at $\frac{1}{3}$, parallel to hind margin, represented by a thin, irregularly-blotched olive-tawny fascia, *preceded* on costa and inner margin by a blackish blotch, and followed by an interrupted series of irregular black blotches, that extends from costa to inner margin; hind margin occupied by 5 or 6 irregular-sized olive blotches, that below the apex being far the largest; a deep black cell-spot. Hind wings like fore wings but with less

dense dark freckling; no basal line, and the largest marginal olive blotch in the central prominence. Face and forehead white; thorax white with strong black markings; abdomen the same. Underside an exact reproduction of upper.

Expanse of wings 60 millim.

Hab. Sikkim.

[I have two males of this very striking species, one of which I took at light at Darjiling in July, the other from Möller's collection. It must be very rare.—*H. J. E.*]

Subfam. Ascotinæ.

Fam. *Boarmidæ*, Guen. Phal. i. p. 213, part.

Medasina quadrinotata, sp. n.

♂. Fore wings light wood-colour, dusted with fine brown transverse striæ, and with all the markings black-brown; costa broadly and densely shaded and mottled with brown-black; beneath this costal suffused dark streak, a pale broad streak of the ground-colour, without any admixture of darker, runs from the base of the inner margin to the hind margin below the apex; it is bounded towards the inner margin by a curved black-brown line running obliquely outwards, and forming the lower half of the basal line; beyond it and a little beyond the middle of the inner margin, a black doubly curved line rises vertically and nearly touches the end of the first line, where it disappears at the edge of the pale streak; it is followed by a narrow pale space and then a deep black blotch; submarginal line pale ochreous, rather glossy, forming 2 or 3 undulations near the costa where it crosses the pale space, and then running with one slight indentation, parallel to hind margin; space beyond it pale ochreous, with distinct black transverse striæ; fringes darker, preceded by a row of shallow black lunules; the submarginal line below the pale space is broadly edged internally with blackish brown, and the whole space between the submarginal line and the pale space, forming altogether an obtuse-angled triangle, is diffusely shaded with blackish brown; cell-spot black, somewhat lost in the costal suffusion; some indistinct traces of the two lines can be detected on the costa. Hind wings with the extreme base whitish ochreous, the whole basal half beyond being brown-black, gradually shading off towards the centre of the wing to the ground-colour and containing a large black cell-spot; just beyond the centre is a black line, slightly curved for $\frac{2}{3}$ from the inner margin, then forming 2 largish teeth on the subcostal veins; this line is followed by a broadish brown-black shade; submarginal line pale, distinct, irregularly wavy, bordered with darker brown on its inner side; submarginal space as in fore wings; fringes paler. Head, palpi, face, and collar dark; thorax and base of abdomen lighter; abdomen dark brown, with a distinct slender black ring at its base. Underside cinereous brown with a reddish tinge, with a broad dark brown

marginal fascia, preceded in the hind wings by the distinct brown central line; apex of both wings broadly creamy white.

Expanse of wings 62 millim.

Hab. Sikkim.

Akin to *M. strixaria*.

[I have a pair only of this species from Möller. It seems quite distinct and must be very rare. The female differs only in greater size and the simple antennæ.—*H. J. E.*]

APOPHYGA, gen. nov.

Akin to *Medasina*, but distinguished by the structure of the ♂ antennæ, which resemble those of *Eubyjodonta* and *Buzura*; the pectinations being stiff and straight, nearly at right angles to the shaft, and themselves with long silky pubescence which extends beyond the apex of each; the palpi are still more acutely pointed and drooping; and the hind wings are rounded, without any trace of a central point. Hind margin of *both* wings finely scalloped. Scaling fine and glossy.

Type, *Apophyga sericea*, sp. n.

APOPHYGA SERICEA, sp. n.

♂. Fore wings pale wood-colour, very finely dusted with brown atoms; extreme base of costa brown; in the centre of the inner margin a brown-black triangular blotch, the outer edge of which is concave outwards, the apex pointing to the apex of the wing; the basal side of the triangle runs parallel to the costa, and after interruption by a pale fascia of the ground-colour is continued towards the submarginal line; this is situated near the hind margin, is irregularly sinuous, broadly shaded internally with brown, and forms 2 contiguous *white* spots in the centre; submarginal area cinereous brown, paler at apex and anal angle; fringes brown. Hind wings whitish, somewhat glossy, mottled towards the base, and inner margin, and suffused along the hind margin with grey, with 3 brown-grey diffuse lines, running from the inner margin as far as the centre of the wing; the 3rd, which is submarginal, really being a brown shade which forms the inner edging of a pale submarginal line. Head and collar brown-black; thorax glossy pale ochreous; abdomen brown, with a broad blackish ring at the base. Underside whitish straw-colour; fore wings with the base towards the costa, the triangle on the inner margin, and a broad marginal fascia cinereous-brown, all three connected by a brown streak along the centre of the wing, the two white spots visible, and the apex and anal angle paler, as on the upper-side. Hind wings with the 2 lines blackish and the hind margin brown; a distinct cell-spot on each wing, which is only visible above on the hind wing.

Expanse of wings 34 millim.

Hab. Sikkim.

[I have several males sent by Möller dated May, September, and October, but I do not know at what elevation they were taken. A

worn specimen, which seems to be a female, has similar markings with less pectinated antennæ. It is a perfectly distinct species.—*H. J. E.*]

DEINOTRICHIA, gen. nov.

Fore wings with costa slightly convex; apex bluntly rounded; hind margin obliquely curved; hind wings rounded, slightly scalloped. Forehead prominent, rounded; palpi short, rough, horizontal; the terminal joint hardly distinguishable, slightly pointing downwards. Antennæ in the ♀ filiform; in the ♂ very strongly plumose, the lateral branches themselves beset with fine down, and with a tendency to recurve; the extreme tip free. Head and thorax woolly; legs rather long and slender. Neuration normal.

Type, *Deinotrichia scotosiaria*, sp. n.

DEINOTRICHIA CERVINA, sp. n.

♂. Wings fawn-coloured with a reddish tinge, with numerous scattered dark transverse striæ; the lines distinct and thick only on the costa; basal line gradually curved; exterior line irregularly denticulated and sinuous, somewhat interrupted; subterminal line pale, sinuous, darker internally, with a rather deep sinus about the centre, above and below which the line is darker; space between the last two lines more reddish; a row of black lunules before the fringes. Hind wings with a small central spot, a dentate central line, and traces of an irregular submarginal line as in the fore wing. Head, thorax, and abdomen concolorous. Underside dull ochreous, varied with greyish; the lines and central spots distinctly darker; the subterminal broadly dark internally.

Expanse of wings 52 millim.

[The type has lost its label, but I remember that the specimen was sent me by the late O. Möller, and was certainly taken in Sikkim or West Bhotan.—*H. J. E.*]

DEINOTRICHIA LIVIDA, sp. n.

♂. Wings dark slate tinged with purple, and at the centre of the inner margin of fore wings with rusty-brown; fore wings with 4 velvety blackish transverse lines; the first, at ⅓ from the base, forms 3 or 4 strong curves outwards, and is twice as near the base on the inner margin as on the costa; it is preceded by a fainter dark line; space included towards base paler slate-colour; 2nd line distinct only at the costa, runs outwards at first, then at rather a sharp angle, turns and runs parallel to hind margin as a nearly straight, ill-defined dark shade; 3rd line strongly denticulated, blackish, followed by a fine pale slate-coloured line, equally denticulated, which is itself edged again with dark; space between basal and 3rd lines darker than the basal area, and becoming bronzy-brown on the inner margin; submarginal line cloudy, consisting of dark blackish blotches between the veins; a row of dark lunules

along the base of the fringes; the apex of the wing is paler slate, like the base; a small dark central dot. Hind wings with a central spot and the second and third lines reproduced. Underside dull cinereous, with the apex whitish; the central dot and central fascia in both wings showing indistinctly darker. Head, antennæ, thorax, and abdomen all dark slate-colour.

Expanse of wings, 52 millim.

Hab. Sikkim.

[I have never taken this fine species myself, but Möller's collectors brought several males and one female from the interior in June.—*H. J. E.*]

DEINOTRICHIA SCOTOSIARIA, sp. n. (Plate XXX. fig. 9.)

♂ ♀. Cinereous-olive, dusted with numerous blackish transverse strigæ, with 3 blackish transverse lines, all thicker on the costa; the first with a paler line inside; the exterior with the paler one externally, this line is bent *inwards* from the costa, then angulated outwards for a short distance, again running straight in the original direction along the middle of the wing, and reaching the inner margin with 3 or 4 short curves; submarginal lines formed of black blotches between the veins, with a paler line beyond, which forms a small abrupt sinus in the centre of the wing; a row of black lunules before the fringe, which is darker and slightly scalloped; a black central spot, with a black costal blotch above it. Hind wings with a regularly denticulated, externally pale-edged central line, and an irregular fainter submarginal one; black lunules and fringe, as in the fore wings. Underside dull ochreous cinereous, paler along the hind margins. Head and abdomen the same.

Expanse of wings 30–56 millim.

The lines are often very indistinct, and the size is particularly variable.

Hab. Sikkim.

The species might easily be taken for a *Scotosia*.

[This was not very rare on Tonglo at 10,000 feet in July. There was a female in Mr. Moore's collection unnamed, from Dalhousie. A much smaller form, which I should have considered distinct on account of the obscure markings of the fore wing and much paler hind wing, was taken at the same time and extends up to 13,000 feet on the Nepal frontier. It is a well-marked variety.—*H. J. E.*]

DRYOCŒTIS, Hüb. Verz. p. 316.

Astacuda, Moore, Lep. Coll. Atk. p. 244.
Pseudangerona, Moore, Ceylon, iii. p. 414.
Serraca, Moore, Ceyl. iii. p. 416.

Type, *D. roboraria*, Schiff.

DRYOCŒTIS NIGRESCENS, sp. n.

♀. Wings dark smoky brown, slightly tinged with purplish, with faint indications of two darker denticulated transverse lines running

parallel to the hind margin, one in the centre, the other halfway to the hind margin; central spot indistinct, absorbed by the central line; underside brownish cinereous, with the 2 lines distinct. Head, thorax, and abdomen smoky brown.

One ♀, rather smaller than *P. separata*.

Hab. Upper Assam.

I was at first inclined to refer this to *P. separata* as a dark variety, but the differences, especially on the underside, appear too great.

[A single specimen from Margarita, Upper Assam, was taken by Doherty in May.—*H. J. E.*]

ALCIS NIGRALBATA, sp. n.

♂ ♀. Fore wings white, thickly dusted with irregular dark grey atoms, which become confluent towards the base and hind margin, and render those parts altogether dark; a dark blackish linear cell-spot with a darkish costal blotch above it, sometimes uniting with it; subterminal line whitish, denticulated, traversing the dark field of the hind margin, and edged internally by a blackish denticulated line; no other line visible. Hind wings the same, with the base scarcely darker, with the subterminal line similar, and a trace along the abdominal margin of the commencement of a geminated dark central band. Underside like upper, but generally duller. Head, thorax, and abdomen cinereous.

Expanse of wings 30 millim.

Hab. Sikkim.

This species comes near *A. granitaria*, Moore, but the ground-colour is whiter and the shading darker; it also approaches *admissaria*, Guen., but is without any of the brownish and ochreous tints of that species, besides being much paler.

[Taken by myself at Tonglo in July and as high as 12,000 feet on the Nepal frontier of Sikkim.—*H. J. E.*]

ALCIS SUBNITIDA, sp. n.

♀. Fore wings glossy, pale grey, dusted with darker grey and ochreous scales; transverse lines indistinctly expressed, being more or less interrupted; base, costa, inner and hind margins darker, more diffused with dark grey; disk paler; basal line hardly distinguishable; in middle of costa a blackish blotch enclosing the dark cell-spot, a double dark spot obliquely below it, and a similar one on the inner margin, the three representing a central shade, running parallel to the hind margin; a denticulated blackish outer line, more distinct on the inner margin, where it is edged with ochreous scales; space beyond to the hind margin dark grey, with an irregularly sinuous pale subterminal line; fringes mottled light and dark grey, with a row of black spots at the base between the veins. Hind wings like fore wings, with a dark transverse line near base, distinct only on inner margin; a small black cell-spot followed by two dark denticulated lines, the latter clearly edged with pale grey. Head, thorax, and abdomen dark fuscous grey.

Underside pale whitish grey, with darker suffusions; the lines indistinctly expressed.

Expanse of wings 50 millim.

Hab. Tonglo, Sikkim.

[I also took a male at the same place and have received the species from my native collectors in the Chumbi valley of Tibet. —*H. J. E.*]

ALCIS SUBRUFARIA, sp. n.

♂. Fore wings reddish grey, with numerous dark grey transverse striæ, and, except in the central area, suffused with a darker, fuscous shade; 1st line distinct, blackish, regularly curved; central shade black, forming 2 angulations exteriorly, the first of which encloses the long black cell-spot, so forming a kind of ocellus; space beyond paler, traversed by a series of black dots, rising from a dark costal spot; exterior line black, thick, denticulate, placed nearer the hind margin than usual; space beyond it more or less completely filled up with dark reddish fuscous; a row of black lunules with pale bases before the fringes, which are blackish brown. Hind wings similarly marked, with hind margin strongly scalloped. Head, thorax, and abdomen all reddish grey. Underside clearer, more yellow, with a broad dark border on both wings, and a large dark blotch in the fore wing round the cell-spot; the whole basal half of the fore wings also dark freckled.

Expanse of wings 36 millim.

Hab. Sikkim.

[I have only seen the type, which was sent without locality by O. Möller.—*H. J. E.*]

ALCIS TENERA, sp. n.

♂ ♀. Fore wings pale greyish ochreous, dusted with darker grey flecks, and suffused beyond the exterior line with yellowish ochreous in the ♂, and brownish grey in the ♀; 1st line, basal, blackish brown, simply curved, plainest on the costa; 2nd line of the same colour, also plainest on the costa, forms 2 slight sinuses, one below the costa, the other just before the inner margin; central dot black, in the ♀ with a costal black spot above it, with which it unites; in the ♂ this spot is much fainter and at times absent; subterminal line irregularly and indistinctly sinuous, paler. In the ♂ all the lines and the cell-spot are followed by a diffuse yellowish band, and the inner margin is more or less tinged with yellowish; in the ♀ the basal half of the wing is more thickly dusted with grey, and beyond the 2nd line suffused irregularly with brownish black and ochreous, and the subterminal line is edged on both sides with darker; a row of distinct black spots before the fringes, which are chequered. Hind wings paler grey, with darker dusting; with a faint cell-spot, an indistinct central curved line, and traces of another towards the anal angle. Head, thorax, and abdomen mottled grey, the latter with the first segment distinctly

paler, sometimes quite whitish. Underside pale grey clouded with darker, the ♀ very much more so than the ♂, especially at the apex of the fore wings; with the central spot and 2nd line of both wings distinct, dark grey, much more strongly marked than on the upper surface; the front wings also showing the basal line, but not so distinct as the other.

Expanse of wings, ♂ 30, ♀ 28 millim.

Hab. Sikkim.

Rather a fragile species, and easily distinguished by the decidedly different coloration of the sexes.

[I have a long series of this species, which varies a good deal, and seems common in July and August at elevations of 7000 to 11,000 or 12,000 feet in Sikkim.—*H. J. E.*]

ARICHANNA BIQUADRATA, sp. n.

♂. Fore wings olivaceous grey, mottled with dark-brown transverse strigæ; markings brownish black, interrupted throughout by the veins, which are distinctly paler than the ground-colour; 1st line broad, double, forming a small costal blotch, 2 small blotches near the base of the cell, the inner one rounded, the outer quadrate; 2 oblong blotches between the median and submedian and 2 small quadrate blotches between the latter and the inner margin; cell-spot large, subquadrate, conspicuous; 2nd line very broad, double, forming a small dark blotch on the costa; 2, contiguous, immediately beneath it, and a large subquadrate blotch beyond and almost touching the cell-spot, becoming broken up and more indistinct towards the inner margin; its outer edge is followed by indistinct and interrupted whitish strigæ; subterminal line interrupted, fine, whitish, most distinct beneath the costa, where it is preceded by a somewhat ill-defined blackish blotch; fringes mottled dark and light olive, with a pale basal line, preceded by a row of black flattened spots between the veins. Hind wings whitish grey, with a dark discal spot, and faint indications of darker bands (one discal, the other submarginal) and a row of dark spots before the fringes, which are paler. Head, thorax, and abdomen dull dark olive. Underside: fore wings dull grey, with scarcely any markings; hind wings more ochreous, with distinct fuscous mottlings and dark discal spot and central band.

Resembles *plagifera*, Moore, but duller in colour; distinguished at once by the absence of the pale oblique apical streak in the fore wings, and the large dark discal blotch.

Hab. Sikkim.

[Taken by myself on Tonglo in July.—*H. J. E.*]

ARICHANNA MARGINATA, sp. n.

♂. Fore wings whitish ochreous, shining; dusted with darker atoms, and largely suffused with olive fasciæ; a dark olive transverse streak *near* the base; basal area bounded by a fine curved silvery line, followed by a broad curved olive fascia, containing

2 darker blotches at its outside on the costa and inner margin, and 2 dark dots on the median vein; exterior line starting from costa at $\frac{1}{3}$, blackish, denticulate, forming a series of curves concave to the hind margin, and curving in so as to reach the inner margin about the middle; central area between this line and the first olive fascia silvery ochreous, with an olive thread-like line down the centre, starting from a black costal spot; cell-spot brownish, standing in the middle of a circular olive patch; exterior line followed by a broad olive fascia like the first, containing a series of oblong darker spots on the veins; subterminal line whitish, denticulated, and apparently double; in the space between the two, opposite the cell, 2 oval dark-brown spots one upon the other; a slightly paler oblique subapical patch; fringes chequered, their base preceded by a row of black separate lunules; hind wings dull ochreous white, slightly dusted with darker, with a distinct dark cell-spot, an undulating dark grey central line, and a broad dark grey submarginal band, which is narrower towards the anal angle, and paler towards the fringes, which are straw-colour, unchequered, preceded by a row of black lunules. Head, thorax, and abdomen pale ochreous olive. Underside pale straw-colour, mottled with dark grey, with the cell-dots large and dark; a dark blotch on the fore wings representing the two oval spots in the submarginal line on the upperside, and a vertical dark-grey blotch between this and the cell-spot.

Expanse of wings 36 millim.

Hab. British Bhotan.

This and *subalbida* are wonderfully alike, but they may be distinguished by the distance of the exterior line from the hind margin. In *marginata* this is nearly in the centre of the wing; in *subalbida* decidedly beyond the centre.

[One male was taken by myself at light at Rikisum at 7000 feet on August 18. This is a halting-place on the upper road to Bhotan.

I have seen a female which agrees with it in Knyvett's collection.—*H. J. E.*]

ARICHANNA RUBRIVENA, sp. n. (Plate XXX. fig. 13.)

♀. Fore wings whitish, almost entirely overlaid with olive-fuscous and ochreous scales, giving the wing a mossy appearance; first line thick, diffuse, dark olive fuscous, at $\frac{1}{4}$, interrupted in the middle and edged internally with paler; exterior line double, each half thick, also dark olive fuscous, slightly sinuous, and interrupted in mid wing, followed by a paler, clearer white space; a diffuse quadrate fuscous-olive blotch on the costa before apex, indistinctly edged with paler; hind margin irregularly suffused with fuscous-olive scaling; fringes mottled, light and dark, preceded by a series of rather large black spots between the veins; a large, squarish dark cell-spot. All the veins well marked in rust-colour. Hind wings rather glossy, dull grey, with the mottlings of the underside showing through; cell-spot small, black. Head, thorax, and abdo-

men mottled fuscous and tawny. Antennæ rust-coloured. Underside dull cinereous, with darker markings showing through; hind wings thickly mottled with rather large darker grey speckles.

Expanse of wings 46 millim.

Hab. Sikkim.

[I have only seen the type, which was from Möller's collection.—*H. J. E.*]

ARICHANNA SUBALBIDA, sp. n. (Plate XXXII. fig. 15.)

♂. Fore wings olive-green, dusted with darker, extreme base dark; basal line blackish, curved, preceded by a darker fascia, and starting from a black costal spot; central shade fine, undulating, also starting from a black spot on the costa; cell-spot dark, but indistinct, being apparently lost inside the central shade; exterior line starting at $\frac{3}{4}$ of the costa, finely denticulate, nearly touching the central line above the inner margin; submarginal line irregular, blackish from the costa, beyond the cell followed by a blackish blotch, and preceded by 2 white spots; above the inner margin preceded by a large semicircular white blotch, and followed by 3 smaller ones; a pale oblique subapical space; fringes slightly chequered, preceded by a dark festoon-shaped line. Hind wings dull whitish; with 2 indistinctly marked dark lines, one central, the other submarginal; fringes white, their basal line scalloped, with a dark dot between each vein. Head, face, thorax, and abdomen all olive-green; shaft of antennæ dotted with black. Underside: fore wings whitish ochreous, the inner half whitish and unspotted, towards the costa and apex irregularly dark-speckled; hind wings ochreous, freckled sparsely with darker.

Expanse of wings 36 millim.

Hab. Sikkim.

[Several specimens, which agree, were taken by Möller's collectors, and I have one from the Naga Hills.—*H. J. E.*]

ARICHANNA TRANSFASCIATA, sp. n.

♂. Fore wings dark olive-green, peppered with darker atoms; a dark brown spot at the base; basal line creamy-white, slightly sinuous, rather oblique, darker edged on both sides; exterior line creamy-white, evenly but slightly curved outwards, with dark fuscous atoms on its inside edge; a large dark ocelloid cell-spot, and between it and the exterior white fascia a black bluntly-denticulated transverse line. Submarginal line irregularly sinuous, white, internally dark-edged; an oblique white streak from the apex, crossing the submarginal line to the exterior line; from the base of the wing a fine white longitudinal line rises, becoming broader beyond the basal white line, and running right through along the median vein into the fringes, which are preceded by black lozenge-shaped spots. Hind wings yellowish-ochreous, with a dark grey cell-spot, a dark central curved line, paler edged externally; hind margin tinged with dark grey, and traversed by an indistinct paler submarginal line. Head, palpi, face, and collar pale ochreous

yellow; thorax and abdomen olive. Underside ochreous, thickly mottled all over with cinereous olive, with all the markings shown, but less strikingly than above.

Expanse of wings 38 millim.

Hab. Naga Hills; Sikkim.

Nearest to *A. tramesata*, Moore.

[Specimens from Sikkim of both sexes agree exactly with the type in markings, though they vary considerably in size.—*H. J. E.*]

ARICHANNA (?) SUBÆNESCENS, sp. n.

♀. Fore wings fuscous, with a slight bronzy tinge, divided into 3 nearly equal parts by the inner and outer lines, which are narrowly pale; the inner, at $\frac{1}{3}$, runs irregularly oblique; the outer, at $\frac{2}{3}$, is irregularly protuberant and nearer the inner on the inner margin than on the costa; the outer third is paler fuscous with a pinkish tinge, thickly sprinkled with dark transverse striæ, and with some irregular dark blotches, of which one on the costa beyond the 2nd line, and a suffused blotch obliquely below it, are most conspicuous; the pale scales of the 2nd line run in along the 4 lower veins into the darker middle band; fringes indistinctly mottled, darker than the outer third. Hind wings with the basal $\frac{2}{3}$ dull bronzy fuscous; the outer $\frac{1}{3}$ dull orange, chequered with grey striæ, most thickly at the anal angle; fringe more visibly mottled, dark and light. Head, thorax, and abdomen all dark bronzy fuscous. Underside like upper, but much duller; both wings with basal $\frac{2}{3}$ cinereous; this space in the hind wings concisely edged with a darker line, which is denticulated at each vein; in the fore wings the dark space is not margined, but the black costal spot beyond it and 2 or 3 smaller ones below it on the veins are very distinct; outer $\frac{1}{3}$ of both wings ochreous yellow, dappled with grey.

Expanse of wings 50 millim.

Hab. Sikkim.

[Two other females taken by me on the Nepal frontier in July; the style of coloration and pattern do not agree with other species of the genus.—*H. J. E.*]

MICRABRAXAS (?) SUBOLIVACEA, sp. n.

♂. Fore wings dull olive-fuscous, with darker fuscous markings, and patches of lilac-blue scales in places, lines all very indistinctly expressed; 2 curved dark shades at end of the basal field; a nearly straight fascia before the discal spot, which is dark but indistinct; and another interrupted one beyond it; subterminal line consisting of a series of interrupted blotches, preceded and followed by lilac-blue scales; a series of rather large black spots along base of fringes, which are olive. Hind wings dull grey, with a slight bluish sheen without any markings. Underside cinereous; fore wings undotted, with the discal dot distinct and the markings showing only along the costa; hind wings paler, mottled with darker atoms; a distinct dark discal dot, and a central dark subangulated line. Head, thorax, and abdomen dull olive-fuscous.

Expanse of wings 42 millim.

Hab. Sikkim.

[Taken at Sundukpho, about 12,000 feet, by my native collectors in July.—*H. J. E.*]

MICRABRAXAS (?) INCOLORATA, sp. n.

♀. Fore wings white, densely dusted with a profusion of dark grey atoms, which are congregated more thickly in places, so as to form indistinct transverse fascia-form blotches; one close to the base, the second curved, representing the first line; the third, also curved and slightly sinuous, beyond the discal spot, which is large and black; subterminal line more distinct as a line, forming a double black blotch at the costa, and opposite the cell; hind margin crenulate, edged with black, and with a large black drop at each vein; fringes whitish. Hind wings dull whitish, with faint cinereous atoms. Face white, thorax and abdomen mottled black and white; antennæ white at base, irregularly white and black along the shaft. Underside cinereous, mottled with darker; the hind wings rather paler than fore wings.

Expanse of wings 48 millim.

Hab. Sikkim. In the absence of the ♂, the location of this species must be considered provisional only.

[I only have this from my native collectors, but specimens from Gnatong on the Thibet frontier, at 12,000 feet, are in Knyvett's collection.—*H. J. E.*]

PŒCILALCIS, gen. nov.

Cleora, Guen. Phal. i. p. 232; Moore, P. Z. S. 1867, p. 629.
Selidosema, Wlk. xxiv. p. 1029.
Gnophos, Wlk. xxxv. p. 1597.
Scotosia, Wlk. xxxv. p. 1687.
Boarmia, Moore, P. Z. S. 1867, p. 631.
Arichanna, Moore, P. Z. S. 1867, p. 658.
Pseudocoremia, Moore, Lep. Coll. Atk. p. 241.

Type, *P. nigridorsaria*, Guen. (*Cleora*).

The genus *Pseudocoremia* was formed by Mr. Butler (Cist. Ent. ii. p. 496; P. Z. S. 1877, p. 394) for a small group of New Zealand insects, one of the characteristics of which is an excessive proneness to variation. Misled by a superficial resemblance, Mr. Moore referred a group of E. Indian forms to the same genus. But the constituents of this group do not vary *inter se*, and are otherwise separable from the New Zealand genus. The margins of both wings are scalloped, whereas in *Pseudocoremia* they are without exception simple.

PŒCILALCIS (?) LATIFASCIATA, sp. n.

♀. Fore wings whitish ochreous, tinged with tawny, and thickly dusted with dark brown short strigæ; basal half of the wing almost wholly covered with confluent dark fuscous atoms, which are densest at the edge, where they include the blackish central

spot; the curved basal line can just be seen through the centre of this patch; submarginal line thick, black, wavy, finely edged with paler, immediately preceded by a tawny shade, the central area between this shade and the basal patch being paler, whitish ochreous, only dusted with dark grey along the costa, at the centre, and slightly along the inner margin; submarginal area tawny, more or less filled up with dark fuscous, of which there is one large patch below the apex, and another above the anal angle; a marginal row of black lunules before the fringes, which are mottled light and dark. Hind wings dull pale ochreous, dusted with grey strigæ, especially towards the base and hind margin, with a dark grey cell-spot; a row of narrow dark lunules before the pale fringes. Head, thorax, and abdomen mottled fuscous and olive. Underside yellowish ochreous, mottled with grey, with the basal half and submarginal area of the fore wings suffused with dull grey; the central fascia showing decidedly paler, and unmottled except along the costa; cell-spots large and distinct on both wings.

Expanse of wings 30 millim.

Hab. Sikkim.

[A common species at 7000 to 10,000 feet in the rainy season.—*H. J. E.*]

Myrioblephara, gen. nov.

Scotosia, Wlk. xxxv. p. 1685.
Cleora, Moore, Lep. Coll. Atk. p. 239.
Arichanna, Moore, P. Z. S. 1867, p. 659.

Type, *M. rubrifusa*, sp. n.

Fore wings with costa very slightly convex; apex blunt; hind margin obliquely curved, slightly scalloped. Hind wings rounded. Palpi shortly porrect, the terminal joint pointed, somewhat drooping; ♀ antennæ simple, ♂ curling, with dense long cilia, which also have a tendency to curl.

Allied to *Pœcilalcis*, but distinguished at once by the ♂ antennæ.

Myrioblephara albipunctata, sp. n.

Fore wings (♂) greyish fawn-colour, finely dusted with darker; lines dark grey; first at $\frac{1}{4}$, slightly curved; second at $\frac{2}{3}$, sinuous, approaching first on inner margin, and nearly touching an indistinct dark central line, which forms an outward bend round the blackish linear discoidal spot; subterminal line evenly and bluntly denticulate, preceded by a broad grey edging, and interrupted in the middle by a pale white triangular blotch; fringes greyish ochreous, with a row of black dots at their base between the veins. Hind wings like fore wings, but with a fulvous suffusion along the middle; the extreme base *white*; the first line thick, black, preceded by blackish scales; the second distinct, blackish, angulated in the middle, near the first, and enclosing the discal dot. Head, thorax, and abdomen whitish, tinged with grey and ochreous.

Underside dull pearly, with the lines and discal spots distinct. Wings in ♀ *whitish*, dusted with ochreous grey, with all the lines and markings subdued and indistinct; underside as in ♂.

Expanse of wings, ♂ 26, ♀ 24 millim.

Hab. Sikkim; Naga Hills.

At first sight the ♀ might be supposed to belong to another species; owing to the white ground-colour, the white triangle which so conspicuously interrupts the subterminal line in the middle is hardly noticeable; but the similarity of the underside, with its fine scaling and pearly gloss, is conclusive as to their identity.

[Taken in May and June by Möller in Sikkim and in the Naga and Karen Hills by Doherty, but seems to be scarce in Sikkim.—*H. J. E.*]

MYRIOBLEPHARA ENORMIS, sp. n.

♂ ♀. Fore wings greenish testaceous, with a fulvous tinge, dusted with fuscous, and with olive-fuscous blotches; a small one on the inner margin near base; a curved fuscous fascia beyond; a sinuous fuscous fascia representing 2nd line; submarginal line consisting of blotches, one on the costa, another below, extending to hind margin; discal spot black, distinct, with a small costal dot above it; fringes mottled, pale olive-tawny and fuscous, preceded by a series of blackish lunules. In the ♂ the whole wing is more or less entirely suffused with fuscous, only the submarginal line showing distinct. Hind wings dull whitish grey, in the ♀ yellow tinged, with the spot and a faint line beyond it darker, but indistinct; some dark fuscous mottling along the hind margin and the inner margin. Head, thorax, and abdomen olive-tawny. Underside duller; fore wings with the outer third darker; hind wings with central line distinct.

Expanse of wings, ♀ 30, ♂ 28 millim.

Hab. Naga Hills.

[Taken in September by Doherty at about 6000 feet.—*H. J. E.*]

MYRIOBLEPHARA RUBRIFUSA, sp. n.

♂ ♀. Fore wings pinkish grey, suffused with deeper pink; all the lines darker pink, thicker on the costa, the 1st forming an angle outwards on the costal vein, the 2nd one beyond the cell; no cell-spot, but a red costal spot above; subterminal line bluntly denticulate; a row of pinkish dots at base of the fringes. Hind wings with a basal, a *geminated* central, and a sinuous subterminal line dark pink. In the ♂ the basal and marginal areas in both wings are suffused with deeper pink or brick-red, so as more or less to obscure the lines, and leaving the central fascia on each wing paler. Head, thorax, and abdomen concolorous. Underside dull pinky, with only the 2nd line distinct; this is pinky brown and much straighter than on the upperside.

Expanse of wings 40 millim.

Hab. Sikkim.

[A rare species, which I took only once on Tonglo at light at

10,000 feet. I have seen one or two other specimens from Möller's collection.—*H. J. E.*]

PRORHINIA, gen. nov.

Near to *Myrioblephara*, from which it may be distinguished by the shortness of the cell, which is scarcely longer than $\frac{1}{3}$ of the fore wing, the oblique discocellular of the fore wing, and the angulated one of the hind wing, but more especially by the quite differently shaped palpi; in *Myrioblephara* these are horizontally porrect, the second joint broad, hairy, the third small, button-shaped; in *Prorhinia* they are much longer, rostriform, drooping, the third joint acute.

Type, *Prorhinia pingasoides*, sp. n.

PRORHINIA PINGASOIDES, sp. n.

♂. Fore wings suffused in part, and also slightly dusted, with mouse-colour; lines dark fuscous; first double, curved, with a slight angulation below the middle; discal spot linear, black, followed by an indistinct fuscous central line; second line thick, straight in its costal $\frac{1}{3}$, then slightly wavy and inclined inwards, ending in a large curve, concave outwards, above the inner margin; submarginal line fuscous, denticulate, followed by 2 darker blotches on the hind margin at $\frac{1}{3}$ and $\frac{2}{3}$ from the costa; fringes white, with a row of contiguous blackish lunules at their base; opposite the 2 dark fuscous blotches of the hind margin the fringes are flecked themselves with fuscous; the spaces between the 2 branches of the first line and between the second and subterminal line are suffused with mouse-colour, as well as the inner marginal portion of the central space. Hind wings the same. Head, face, and thorax whitish; palpi, top of collar, and patagia blackish; abdomen mouse-colour. Underside of both wings pearly white, with a broad mouse-colour marginal band, which is interrupted by white spaces before the fringes and by a larger white spot at anal angle; discal spots distinct, lying in a short mouse-colour shade.

Expanse of wings 28 millim.

Hab. Naga Hills.

At first sight this insect recalls a small *Pingasa*.

[The type was the only one received, and is very distinct in coloration; taken by Doherty at about 3000 feet.—*H. J. E.*]

PSILALCIS, gen. nov.

Tephrosia, Wlk. xxxv. p. 1590.

Narapa, Moore, Ceyl. iii. p. 411, part; Swinhoe, P. Z. S. 1889, p. 426.

Type, *Psilalcis inceptaria*, Wlk.

The type of *Narapa*, Moore, has pectinated antennæ in the ♂ like *Alcis*, and will, I think, have to be placed in that genus. A few species, however, which in markings and general aspect

resemble *Alcis*, have simple ♂ antennæ, and for these I propose the generic name *Psilalcis*.

PSILALCIS ATRIFASCIATA, sp. n.

♂. Fore wings testaceous grey, with fulvous suffusion and very finely dusted with dark atoms; 1st line blackish, very much curved outwardly, with slight denticulations on the veins; 2nd line thick, black, denticulate outwardly, and forming a very decided angulation just above the centre of the wing; space between the lines filled up with purplish black, with a darker denticulate central shade in the middle; submarginal line more or less regularly cuneiform, preceded and followed by fulvous, dusted with greyish silvery; costal space between 2nd and submarginal lines diffusely fuscous; a diffuse dark fuscous blotch from the angulation of the 2nd line runs obliquely to the hind margin; inner margin, from base to anal angle, pale fulvous; fringes chequered, preceded by a row of shallow black lunules. Hind wings much paler, with very indistinct markings, but with distinct discal spot. Head, antennæ, thorax, and abdomen (greasy) fuscous. Underside as above, but much duller.

Expanse of wings 28 millim.

Hab. Sikkim.

[I have seen only two males of this rare species, taken by Möller's collectors.—*H. J. E.*]

PSILALCIS DENTILINEA, sp. n.

♂. Fore wings whitish ochreous, sparsely dusted with irregular fuscous atoms, with a longitudinal yellowish stripe along the median, extending to the fringes; 1st line fuscous, indistinct, interrupted, forming 2 curves concave basewards and 3 teeth pointing to the base on the subcostal, median, and submedian veins: this line is edged internally by spaces of pale ground-colour, entirely without dark atoms, most broadly in the 2 curves; 2nd line, which is twice as far from the 1st on the costa as on the inner margin, also denticulate *outwards* on the veins, and forming a series of small curves between them and one larger one above the inner margin, approaching the lower of the two curves of the 1st line; discal spot dark fuscous; space between the 2 lines much dusted with fuscous, especially towards costa and inner margin, and sometimes almost suffused with fuscous; the 2nd line is followed by a series of pale spaces similar to those before the 1st line; submarginal line formed of interrupted fuscous blotches, wedge-shaped externally, and followed by an interrupted pale denticulate line; hind margin itself fuscous in places; fringes chequered, fuscous and ochreous. Hind wings like fore wings, but with the central band almost obsolete; the discal spot distinct, with a broad fuscous margin in the ♂, and almost white in the ♀. Face pale ochreous; antennæ and thorax dark fuscous; abdomen ochreous, suffused with fuscous, paler in ♀ than in ♂.

Underside like upper, but with the darker tints stronger, especially in the ♂.

Expanse of wings 26 millim.

Hab. Sikkim; Naga Hills.

[One male taken by myself at light at the Rangbi bungalow near Darjiling, about 5500 feet elevation, on June 7th, and one ♂ by Doherty in September at 3000 feet.—*H. J. E.*]

Subfam. SCOTOPTERYGINÆ.

Fam. *Boarmidæ*, Guen. Phal. i. p. 213, part.

SCOTOPTERIX PERMUSCOSA, sp. n.

♂. Fore wing greyish ochreous, with a pinkish tinge, slightly dusted with darker, and suffused with pale brick-red and olive-brown; basal line blackish, thicker on the costa, forming an obtuse subcostal angulation and a rounded sinus above the inner margin, preceded by a more indistinct brownish line; basal area irregularly suffused with darker; exterior line blackish, fine, forming a largish curve outwards beyond the cell, then running obliquely to the inner margin with one or two slight inequalities; it is followed immediately by an interrupted reddish-grey shade; cell-spot dark, with a dark costal blotch above it; subterminal line indistinctly paler, forming 2 prominent wedge-shaped markings, filled up with blackish, below the costa and above the inner margin; base of the fringes convexly scalloped; the veins before the fringes blackish; the whole costa is finely, and the hind margin broadly, darker than the rest of the wing. Hind wings with the exterior line and hind margin as in the fore wings; the basal half paler, without markings. Underside clear pale ochreous, with distinct dark cell-spots and a broad submarginal brownish fascia, paler towards the fringes.

Expanse of wings 38 millim.

Hab. Bhotan.

[Specimens from Sikkim are smaller than the type. I have it also from the Naga Hills and East Pegu.—*H. J. E.*]

SCOTOPTERIX ALBISTELLARIA, sp. n.

♂ ♀. Wings dull leaden grey, plentifully irrorated with reddish scales; the central fascia is preceded and followed by a narrow band of the ground-colour; the central fascia is darkened by blackish scales, and contains a whitish, black-ringed ocellus; beyond the central fascia are two narrow undulating fasciæ of mingled red and blackish scales, followed by a third paler fascia of the ground-colour, which is itself succeeded by an interrupted reddish fascia; fringes leaden grey, with a series of dark spots at base. Hind wings similar. Head, thorax, and abdomen dark grey, tinged with reddish. Underside pale glossy grey, with hardly any markings.

Expanse of wings 24 millim.

Hab. Khasia Hills.

[Taken by me in September at about 6000 feet.—*H. J. E.*]

ELPHOS PRÆUMBRATA, sp. n.

♀. Fore wings straw-colour, with a yellow suffusion, sprinkled pretty thickly with round dark atoms; 1st and 2nd lines black, exactly like those of *E. hymenaria*; ocelloid cell-spot obsolete above, with a vertical black costal spot exactly above it, whereas in *E. hymenaria* this spot is obliquely nearer the base; a dark blackish smoky suffusion occupies the whole apical portion of the wing, except the extreme apex itself; the edge of the suffusion running obliquely from the costa at the origin of the 2nd line to the hind margin shortly above the anal angle. Hind wings like fore wings, with the apical portion only slightly and diffusely smoky. The whole of the wing-surface much clearer yellow, and not dusted and suffused with smoky bluish-grey atoms and shades as in *E. hymenaria*. Underside clear white, with dark grey mottlings, and the smoky apical suffusion of the upperside exactly reproduced in black. (In *hymenaria* the disk of both wings is suffused with cinereous, and the margins have a broad black fascia.) Head and thorax dark mottled; abdomen yellowish, with blackish markings above on each segment; clear yellowish below.

Expanse of wings 80 millim.

Hab. Perak.

[A single specimen only of this very fine species was taken by Doherty.—*H. J. E.*]

EXPLANATION OF THE PLATES.

PLATE XXX.

Fig. 1. *Photoscotosia atromarginata*, ♂, p. 369.
2. *Cidaria exquisita*, ♂, p. 375.
3. —— *intertexta*, ♂, p. 374.
4. —— *dentistrigata*, ♂, p. 374.
5. *Amæbe niveopicta*, ♀, p. 372.
6. *Gagitodes olivacea*, ♀, p. 382.
7. *Paralophia pustulata*, ♀, p. 371.
8. *Eurypeplodes irambata*, ♀, p. 382.
9. *Deinotrichia scotosiaria*, ♂, p. 420.
10. *Photoscotosia multilinea*, ♂, p. 369.
11. —— *fulguritis*, ♂, p. 370.
12. *Paricterodes* (?) *violacea*, ♀, p. 391.
13. *Arichanna rubrivena*, ♂, p. 424.
14. *Loxaspilates dispar*, ♀, p. 413.
15. *Abraxas alpestris*, ♂, p. 394.
16. *Perizoma lacteiguttata*, ♂, p. 378.
17. —— *variabilis*, ♀, p. 377.
18. —— *interrupta*, ♀, p. 380.
19. —— *apicistrigata*, ♂, p. 378.
20. —— *fasciata*, ♀, p. 379.
21. *Eupithecia costipicta*, ♀, p. 383.
22. —— *rubrinotata*, ♂, p. 384.
23. —— *albispumata*, ♀, p. 384.

PLATE XXXI.

Fig. 1. *Comostola cærulea*, ♂, p. 354.
2. *Microloxia efformata*, ♂, p. 354.
3. *Hemistola rubrimargo*, ♂, p. 354.

Fig. 4. *Hemithea nigropunctata*, ♂, p. 353.
5. *Berta albiplaga*, ♂, p. 357.
6. *Gelasma griseoviridis*, ♀, p. 353.
7. *Aplochlora viridis*, ♂, p. 386.
8. *Dyspteris asiatica*, ♂, p. 358.
9. *Abraxas triseriata*, ♀, p. 394.
10. *Psilonaza obliterata*, ♀, p. 343.
11. *Micronidia subpunctata*, ♂, p. 387.
12. *Opisthograptis mölleri*, ♂, p. 403.
13. *Prionodonta amethystina*, ♂, p. 402.
14. *Ulioenemis delineata*, ♂, p. 356.
15. —— *signifera*, ♀, p. 357.
16. *Amathia rivularis*, ♀, p. 363.
17. —— *sanguinipunctata*, ♀, p. 363.
18. —— *nigronotata*, ♂, p. 362.
19. *Eupithecia atroviridis*, ♂, p. 384.
20. *Phikonoloba olivacea*, ♀, p. 363.
21. *Lobogonia ambusta*, ♂, p. 346.
22. *Chiasmia strigata*, ♂, p. 412.
23. *Orthocabera brunneiceps*, ♂, p. 387.

Plate XXXII.

Fig. 1. *Dysethia bicommata*, ♂, p. 348.
2. *Tanaotrichia trilineata*, ♂, p. 361.
3. *Anonychia rostrifera*, ♀, p. 412.
4. *Hydrelia lilacina*, ♂, p. 364.
5. —— *marginepunctata*, ♀, p. 364.
6. *Asthena rufigrisea*, ♀, p. 364.
7. *Somatina lapidata*, ♀, p. 359.
8. *Heteromiza cervina*, ♂, p. 405.
9. *Pomasia moniliata*, ♀, p. 367.
10. *Asthena ochracea*, ♀, p. 364.
11. *Idæa falcipennis*, ♀, p. 362.
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13. *Sphagnodela lucida*, ♂, p. 351.
14. *Terpna opalina*, ♀, p. 349.
15. *Arichanna subalbida*, ♂, p. 425.
16. *Chalybocydon marginata*, ♂, p. 366.
17. *Xenozancla versicolor*, ♂, p. 342.
18. *Isoloba bifasciata*, ♂, p. 345.
19. *Garæus discolor*, ♀, p. 400.
20. *Perixera obscurata*, ♂, p. 361.
21. *Gonodontis vinosa*, ♀, p. 398.
22. *Zamarada* (?) *marginata*, ♂, p. 388.
23. *Amorphozancle discata*, ♂, p. 408.
24. *Lipomelia subusta*, ♂, p. 360.
25. *Omiza muscicolor*, ♀, p. 407.
26. *Ischalis colorata*, ♂, p. 401.

May 2, 1893.

Sir W. H. Flower, K.C.B., LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of April 1893 :—

The total number of registered additions to the Society's Menagerie during the month of April was 130, of which 58 were by presentation, 18 by birth, 24 by purchase, 18 were received in exchange, and 12 on deposit. The total number of departures during the same period, by death and removals, was 99.

Amongst these special attention may be called to :—

1. A young male Orang (*Simia satyrus*) brought home from Singapore, and presented April 19th by Thomas Workman, Esq., of Belfast and Singapore.

2. A White-bellied Hedgehog (*Erinaceus albiventer*), from Somaliland, presented by H. W. Seton-Kerr, Esq., F.Z.S., April 24th. This species is new to the Collection.

3. A female Gibbon, brought home from North Borneo, and presented by Leicester P. Beaufort, Esq., April 25th. This Gibbon is generally of a dark ashy colour with a black patch on the crown, and blackish on the lower surface and inner sides of the limbs. I am inclined to refer it to one of the varieties of *Hylobates muelleri*, Martin. It has been placed along with the male Hainan Gibbon (*Hylobates hainanus*), received Nov. 1st, 1892 (see P. Z. S. 1892, p. 541), and they agree well together.

Mr. Sclater called attention to the protrusion of a fleshy mass from the cloaca occasionally exhibited by the Greater Vasa Parrot (*Coracopsis vasa*), as recorded by him, P. Z. S. 1884, pp. 410, 562; and stated that, owing to the kindness of the Hon. Henry S. Littleton, of 22 Rutland Gate, he had himself lately had an opportunity of observing another case of this curious phenomenon.

A bird of this species, for several years in that gentleman's possession, was stated to be in the habit of exhibiting this appearance every spring, and did so for some time in Mr. Sclater's presence on the 28th ult. Mr. Sclater was able to make a careful examination of the bird, and had convinced himself that the strange appearance was caused by the protrusion of the inner membrane of the lower portion of the cloaca, which was abnormally swollen at this time of year, and could be protruded and withdrawn at the will of the bird. Mr. Sclater was able to effect its partial protrusion after withdrawal by pressure on the cloaca. He had no doubt the bird was a female, as in the other cases previously observed. The extraordinary point was that no exactly similar phenomenon was known to occur in any other species of bird.

Mr. Sclater laid on the table the following List of the dates of the receipt from the printers of the sheets of the Society's 'Proceedings' from 1831 to 1859 inclusive, which had been drawn up

from the records kept by Messrs. Taylor and Francis, the Society's printers. Several applications had been made to ascertain these dates, and it was now proposed to publish the list in the Society's 'Proceedings' for future reference.

List of the Dates of Delivery of the Sheets of the 'Proceedings' of the Zoological Society of London, from the commencement in 1830 *to* 1859 *inclusive.*

PROCEEDINGS OF THE COMMITTEE OF SCIENCE AND CORRESPONDENCE OF THE ZOOLOGICAL SOCIETY OF LONDON.

No.	Pages.	Date of Delivery.	Year.
	PART I. (1830–31).		
i.	1–16	Jan. 6	1831
ii.	17–24	Feb. 1	,,
iii.	25–36	Mar. 2	,,
iv.	37–44	Apr. 6	,,
v.	45–60	May 6	,,
vi.	61–72	June 4	,,
vii.	73–88	July 8	,,
viii.	89–108	Aug. 5	,,
ix.	109–112	Sept. 1	,,
x.	113–128	Oct. 25	,,
xi.	129–136	Oct. 31	,,
xii.	137–148	Dec. 6	,,
xiii.	149–164	Jan. 16	1832
xiv.	165–182	Mar. 2	,,
	PART II. (1832).		
xv.	1–24	Mar. 29	1832
xvi.	25–48	Apr. 21	,,
xvii.	49–76	June 5	,,
xviii.	77–108	July 31	,,
xix.	109–120	Aug. 14	,,
xx.	121–132		
xxi.	133–140	Nov. 22	,,
xxii.	141–148		
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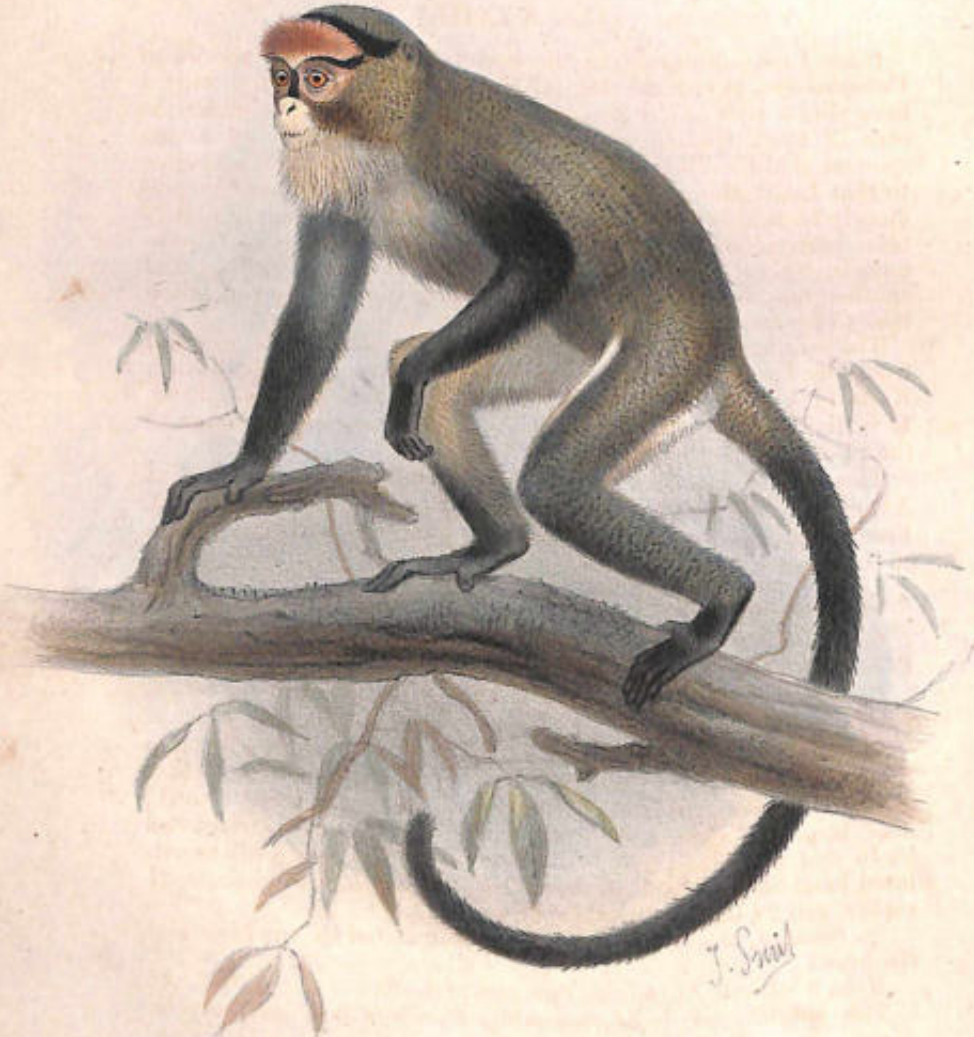
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J. Smit del. et lith.

Mintern Bros. imp.

CERCOPITHECUS BRAZZÆ.

The following papers were read:—

1. Additional Notes on the Monkeys of the Genus *Cercopithecus*. By P. L. Sclater, M.A., Ph.D., F.R.S., Secretary to the Society.

[Received April 26, 1893.]

(Plate XXXIII.)

Since I communicated to the Society my list of the species of *Cercopithecus*, at our meeting on March 14th (see above, p. 243), I have paid a visit to the Zoological Museum at Florence, under the care of Prof. Giglioli, and have had an opportunity of seeing specimens of *Cercopithecus boutourlinii* (see above, p. 256) belonging to that Institution,—one of the species of which I had not previously been able to examine examples. Prof. Giglioli has lately been persuaded by his friends to reunite this species to *C. albogularis*, Sykes[1]; but after examining the typical specimen and another one subsequently received, I have come to the conclusion that *C. boutourlinii* is quite distinct from *C. albogularis*.

The original specimen of *C. boutourlinii* was a female, received from Dr. Traversi in 1887, and stated to have been obtained in Kaffa (a province of Abyssinia to the south of Shoa) in 1885. It is in very imperfect condition, as will be seen on inspection of the photographs which I now exhibit.

The second specimen is a male, obtained by Dr. Traversi at Abugifar in Gimma[2] in 1887 and received at Florence in 1889. From these specimens I have drawn up the following description of this species.

Cercopithecus boutourlinii.

Cercopithecus boutourlinii, Gigl. Zool. Anz. 1887, p. 509; Scl. P. Z. S. 1893, p. 256.

Cercopithecus albigularis, Gigl. Ann. Mus. Civ. Genov. ser. 2, vol. vi. p. 8 (err.).

♂. Body-hairs long and rough; upper surface black, with pale fulvous annellations, except on a line between the shoulders which is nearly black; ears nearly nude, with an inner hairy pencil; nose, upper lip, chin, and throat white; rest of under surface and limbs and tail black, except the base of the tail, which has annellated hairs like the back all round. Total length of body about 21 inches, tail 24 inches, together 45 inches.

♀. Smaller, nearly similar, but less annellated on the back and the head.

Hab. Southern Abyssinia, Province of Kaffa.

This species, no doubt, resembles *C. albogularis*, and may be

[1] See "Vertebrati dello Scioa," in Ann. Mus. Civ. Genova, ser. 2, vol. vi. p. 8.

[2] Gimma is in Central Abyssinia to the south of the Province of Gojan, between latitudes 9° and 10°.

referred to the same group, but is easily distinguished from it by several characters. In the first place the pure white nose and upper lips, which are very noticeable in the male specimen last received (see figure), separate it at once from *C. albogularis*, in which, as will be seen by the skin now exhibited, there is no



Cercopithecus boutourlinii, from a photograph of the stuffed specimen received in 1889.

trace whatever of this colour. This feature is so prominent that it would almost justify the removal of the species to the "Spot-nosed" group of my arrangement (see above p. 244). But in most respects *C. boutourlinii* agrees better with *C. albogularis* and the other species of my section D, MELANOCHIRI.

Another point in which *C. boutourlinii* differs from *C. albogularis* is the black belly and much blacker limbs. In *C. albogularis* the belly is pale grey, and the external surface of the limbs is of a dark grey, more or less annellated. Again, *C. albogularis* is a short-

and smooth-haired species, but *C. boutourlinii* is long- and rough-haired, which indicates existence in a much colder climate.

Another Monkey in the Florence Museum which attracted my attention was a stuffed specimen of *Cercopithecus brazzæ*, Milne-Edwards, labelled "♀ Congo, 1888," the gift of Count G. Brazza-Savorgnan. Monsieur Milne-Edwards has also kindly forwarded to me from Paris a flat skin of another individual of the same species which I now exhibit. As no full description of this remarkable Monkey has yet been published, the following description taken from these specimens may be useful:—

CERCOPITHECUS BRAZZÆ. (Plate XXXIII.)

Cercopithecus brazzæ, Milne-Edwards, Rev. Sc. sér. 3, xii. p. 15 (1886); Scl. P. Z. S. 1893, p. 255.

Above pale fulvous, densely annellated with black; frontal band of dense erect hairs chestnut, with slight white tips; this is bordered behind by a broad black band which extends between the ears; ears naked or nearly so; upper part of nose and narrow line above the eyes, in front of the rufous band, black; lower nose and upper lips white; chin and throat furnished with long whit hairs, which are much elongated in the middle line and form a long white beard; belly like the back, but darker; hands and feet black; inner side of thighs, anus, and a line along the middle of the thighs outside, white; tail black, except just at the base, where it is like the back. Length of body 21 inches, tail 22 inches.

Hab. French Congo-land.

The erect frontal band, which is very prominent, and the long white beard, which is not so pointed as in *C. diana* and extends some way down the middle of the throat, render this species of *Cercopithecus* very remarkable. The white band which extends from the anus across the haunches on each side and down the outside of the thighs somewhat resembles that found in *C. diana*.

There can be no doubt that *C. brazzæ* is a close ally of *C. neglectus*, and it is even possible that the two species may be the same. But on comparing the present skin of *C. brazzæ* with the flat and imperfect skin of *C. neglectus* in the British Museum, I find the general colour of *C. neglectus* much more brownish, and the band on the hind legs across the haunches yellowish instead of white. The front part of the face-skin of the specimen of *C. neglectus* having been cut away, it is impossible to say whether it ever possessed the erect red frontal band of *C. brazzæ*, but there are some indications of the band left on the skin. In other respects the two skins are much alike, and had they been from the same locality I should have been inclined to refer them to the same species.

I have also to announce that we have lately lost our unique living specimen of *Cercopithecus stairsi* (P. Z. S. 1892, p. 580). I now exhibit its skin, which it is proposed to transfer to the National Collection. The figure and description already given are sufficient for the recognition of this remarkable species, which, as previously

stated, is at once recognizable by the bright chestnut bands, which commence on each side of the forehead and are carried over the head behind the ears. I may also remark that the lower part of the back and upper surface of the tail are stained with red, which is not shown in my original figure of this Monkey (P. Z. S. 1892, pl. xl.).

2. On a Stag, *Cervus thoroldi*, from Tibet, and on the Mammals of the Tibetan Plateau. By W. T. Blanford, F.R.S., V.P.Z.S.

[Received May 2, 1893.]

(Plate XXXIV.)

In the course of Captain Bower and Dr. W. G. Thorold's adventurous journey across the Tibetan plateau from west to east, two specimens of a Stag were shot by the latter at a spot about 200 miles N.E. of Lhassa[1]. These animals were killed in the snow amongst brushwood just above the forest, at an elevation of about 13,500 feet above the sea. Of one individual a complete skin, skull, and horns have been brought to England, and are now in the Natural History Museum; of the other, the head with the skin and horns has been preserved and has been left by Dr. Thorold in London, so that I have been able to examine both.

Last February I received a letter from Dr. Thorold in which he asked me to look at the specimens and let him know to what species I thought they belonged. Some time before this I had heard from Mr. Oldfield Thomas that the complete specimen had been received by the Museum but had been sent away to be stuffed. I, however, saw the head, which had been mounted, and although I did not like to come to any decided conclusion without having an opportunity of seeing the skin also, I was disposed to believe that the Deer was probably the same as that to an immature horn of which the name of *Cervus nariyanus* was given by Hodgson in 1851, and was clearly identical with the species of which the head was described and figured by Mr. W. L. Sclater in 1889 (J. A. S. B. lviii. pt. 2, p. 186, pl. xi.), and which was shown to be allied to the Mantchurian *C. dybowskii*.

For the last two months the skin has been in the hands of the taxidermists, but I have at length, by permission of Dr. Günther, been able to examine it; and I have now no hesitation in saying that I believe the Stag obtained by Dr. Thorold must be regarded as an additional peculiar species of the extraordinarily specialized mammalian fauna inhabiting the Tibetan plateau. The following are the principal characters:—

The animal is about the size of a Red Deer, *C. elaphus*. The

[1] I am indebted to Captain Bower for several of the details. The approximate position is in lat. 31° 40′ N., and long. 93° 30′ E.



J. Smit del. et lith.

Mintern Bros. imp.

CERVUS THOROLDI.

height at the shoulder must have been about 4 feet, that measurement on the body over the curves to the withers having been recorded by Dr. Thorold as 4 ft. 5 in., and the length from the insertion of the tail to the nose 6 ft. 1½ in. The tail (with hair probably) measured only 4 inches. The ears are of moderate size and pointed, and measure outside in the mounted skin 9½ inches from the head.



Head of *Cervus thoroldi*.

The horns are distinguished at once by the want of the bez tine characteristic of the Elaphine group and found in the other Tibetan Stag *C. affinis*. There are five points on each horn (except one, which has only 4), and there can be very little doubt that this is the number characteristic of the adult. The beam is angularly bent at the insertion of the second tine (corresponding in position to the tres tine of *C. elaphus*), and above this is gradually curved back and presents the peculiarity that the upper four points and the upper part of the beam are nearly in a flat plane. Another conspicuous character is that (except in one horn which is slightly abnormal) the third tine exceeds all the others in length. The corresponding tine (4th) is generally the longest in the Wapiti,

and the upper part of each horn in the present animal much resembles that of *C. canadensis* in shape.

Each horn measures round the curve outside 38 inches, none of the four differing more than a quarter of an inch more or less. The girth above the burr is 5·25. The following are the measurements of the different tines on one horn in inches:—

Lowest or brow tine	7·5
2nd (=tres)	10·25
3rd	11
4th	4
5th	2·5

The coloration of the skin is very uniform brown, minutely speckled, scarcely paler on the lower parts, but much paler and ochreous buff on the small pygal disk which completely surrounds the tail, this latter being also pale rufous throughout. Ear whitish within. The muzzle, chin, and under surface of lower jaw white. The hairs of the body are stiff, long, and very coarse, and somewhat resemble those of the Musk-deer, being filled inside with a cellular pith-like tissue and having very small roots[1]. The hair of the body is long, dark brown, except at the base which is whitish, and at the tips which are buff. The pale tips are wanting around the caudal disk, so that the latter appears to be surrounded by a dark band. The hair along the spine is directed forward from above the hips as far as the wither, where the anterior direction ceases abruptly. This character is quite peculiar.

The muffle or rhinarium occupies the whole area between the nostrils, and a rather narrower portion extends to the upper lip.

The skull presents a few peculiar characters, the most important of which have been already noticed by Mr. W. L. Sclater. As a whole the skull is short when compared with other skulls of Elaphine Deer; the muzzle is especially short, but broad. The hinder part of the skull is distinctly lower and flatter than that of *C. elaphus*, the forehead continuing the line formed by the nasals and not curving upwards into a ridge between the horns. In this respect the present specimen shows some resemblance to Rusine and Pseudaxine skulls, but the evidence of affinity is small. The termination of the bony palate in the middle above the opening of the posterior nares is between the last molars, whereas in all other Deer of which I have examined the skull the opening is farther back.

But by far the most peculiar character, as already noticed by Mr. Sclater, is the form of the nasals. These, a little way from the posterior termination, are fully twice as broad as they are in front, each bearing on the outer side a large rounded lobe-like expansion, so as to cover over the greater part of the lachrymal vacuity, which is much narrower than in Elaphine or Rusine deer.

[1] I am indebted to Mr. E. Gerrard for calling my attention to the very peculiar structure of the hair.

The following are measurements in inches:—

Basal length of skull, from anterior border of foramen magnum to anterior end of premaxillaries	13·4
Length from posterior border of occipital condyles to ditto	14·3
Breadth across posterior edges of orbits	6·8
Breadth across premaxillaries just above canines	2·9
Length of nasal bones	5·85
Greatest breadth of nasals between lachrymal vacuities	3·0
Breadth of nasals in front at suture between maxillary and premaxillary	1·45
Length of row of upper molars and premolars	4·3
Length of upper three molars alone	2·6

On the whole I can see no very close affinity between this and any known species of *Cervus*; the present species approaches some forms of the Elaphine group quite as much as any other Cervine type, perhaps more. I can see no evidence of Pseudaxine affinity, such as the horns might perhaps suggest. On the whole the species is probably as near to *C. cashmirianus* and *C. affinis* as to any other, though perfectly distinct from both.

As regards the name of the present species, some little difficulty arises. As already mentioned, it is most probable that the horn to which the name *Cervus nariyanus* was given by Hodgson (J. A. S. B. xx. 1851, p. 292, pl. viii.) belonged to a younger individual of the same species. This horn was said to have been brought from Ladák, it was 34 inches in length, and had four points, the two lower being more than 4 inches apart, so there was no bez tine. Judging by the figure[1], the horn was more massive than would be expected in a young specimen of Thorold's Stag. Mr. Hodgson remarked that "the Bhotiahs who brought this horn say it belonged to a very young animal, and that the species, which is proper to Gnári or Western Tibet, is larger than the Shou" (*C. affinis*). The Stag obtained by Dr. Thorold is considerably smaller than the Shou; there is, so far as is known, no Stag in Western Tibet, *C. cashmirianus* being limited to the Kashmir valley, at all events on the north and east of its range, and, as is well known, young examples of *C. elaphus*, and I believe of the Wapiti also, frequently want the bez tine: so that it is by no means impossible that the Ladák horn may have belonged to a young *C. cashmirianus* from Kashmir, to *C. yarkandensis* from Eastern Turkestan, or even to *C. eustephanus* (*C. canadensis*, var.) from the Thian Shan, Ladák being connected with all these regions by trade routes. The Bhotiah story was probably pure fiction.

There is, moreover, one very strong reason for not using the name

[1] The original specimen cannot be found in the British Museum, though Mr. Oldfield Thomas has searched for it. As no mention of it is to be found in the published catalogue of Mr. Hodgson's collections, it was perhaps not included in them.

C. nariyanus for the present animal even if, as is highly probable, it was the species that furnished the horn described and figured by Hodgson. The name was taken from Nári, the Western (or rather perhaps the South-western) province of Tibet, often called Gnári or Nári-Khorsum, a tract, as represented on maps, of no great breadth from north to south, but extending along the north of the Himalayas from the western extremity of Tibet proper near Rudok to between long. 80° and 85° E. This region, part of which is known as Hundes, is on the frontier of our own territory, and has been visited at several points by British sportsmen. If any Stag inhabited the region, it is incredible that nothing should have been heard of it; moreover, the whole of the upper valleys of the Sutlej and Yárotsánpo or Brahmaputra, of which the area consists, is a barren, treeless, almost bushless waste, differing essentially from the country inhabited, so far as is known, by any species of *Cervus*. I think it extremely improbable that any Stag inhabits Nári; and under these circumstances it is not desirable to apply the name *nariyanus* to a species which does not occur there.

Whilst Mr. Sclater pointed out the similarity of the head which had been purchased in the Darjiling bazaar, and was described by him, to that of *Cervus dybowskii*, he was careful to avoid identifying the two. It is clear that he was perfectly right in supposing that the head, the skin of which was dried on, had come from Tibet. Now that we have the whole skin and dimensions, it is evident that the species is distinct from *C. dybowskii* (P. Z. S. 1876, p. 123, woodcut of head and horns, p. 124), which is a much smaller form, spotted at all seasons, although the spots in winter are described as indistinct and confined to the posterior part of the body. So far as is known the horns in the adult of *C. dybowskii* only bear 4 points each, and the shape of the beam is different, being more regularly curved.

As therefore the Tibetan species requires a name, I think it impossible to do better than to call it *Cervus thoroldi*, after its discoverer. The following are the principal characters :—

Cervus magnitudine ad C. elaphum *proxime accedens; fuscus, immaculatus, areâ pygali circum caudam porrectâ pallide rufâ ornatus; pilis hirtis crassis longiusculis, in medio dorso ab uropygio usque ad humeros antice versis, indutus; cornibus singulis valde curvatis, ramos ad quinque gerentibus; ramo secundo a primo vel basali multo distante, tertio longiusculo.*

Plate XXXIV. represents the stuffed specimen in the British Museum, the type of the species; the cut (p. 445) is taken from the head of the other specimen, still belonging to Dr. Thorold.

About a year ago, when discussing the geological age of the Central Asiatic highlands[1], I had occasion to call attention to the remarkable specialization of the mammalian fauna inhabiting the Tibetan plateau. The Stag now described adds another to the

[1] Geological Magazine, April 1892, (iii.) ix. p. 164.

species peculiar to this tract of elevated country, and the list of these Mammals as amended may be of interest to Zoologists. It is therefore added here.

Mammalia of the Tibetan Plateau.

Insectivora.

Crocidura araneа.
†*Nectogale elegans.*

Carnivora.

Felis manul.
F. lynx.
F. uncia.
**Paradoxurus laniger.*
Canis lupus, var. *laniger.*
Vulpes alopex, var. *flavescens.*
**V. ferrilatus.*
Cyon deccanensis, var.
Mustela foina, var.
**Putorius larvatus.*
**P. canigula.*
P. alpinus, var. *temon.*
P. erminia.
**Meles leucura.*
**M. albogularis?*
†*Æluropus melanoleucus.*
**Ursus pruinosus.*

Rodentia.

†*Eupetaurus cinereus.*
**Arctomys himalayanus.*
**A. robustus.*

Rodentia—*continued.*

**Mus sublimis.*
**Microtus (Arvicola) blythi.*
**M. strauchi.*
**M. (Eremiomys) przevalskii.*
Siphneus fontanieri.
**Lagomys curzoniæ.*
**L. rutilus.*
**L. erythrotis.*
**L. melanostomus.*
**L. ladacensis.*
**Lepus oiostolus.*
**L. hypsibius.*

Ungulata.

Equus hemionus, var. *kiang.*
**Bos grunniens.*
**Ovis hodgsoni.*
O. vignei, var.
**O. nahura.*
Capra sibirica.
†*Pantholops hodgsoni.*
†*Budorcas taxicolor?*
**Gazella picticaudata.*
**Cervus affinis.*
**C. thoroldi.*
Moschus moschiferus.

In this list * signifies a peculiar species, † a peculiar genus; that is, a species or genus not known to exist out of Tibet.

This is a list of the mammals known to inhabit the plateau north of the Himalayas and south of the Kuenlun, Altyn Tag, and Nanshan, at elevations exceeding 12,000 feet. Many of the forms named only inhabit small portions of the area, and whilst *Bos grunniens*, *Ovis hodgsoni*, *Pantholops hodgsoni*, and *Gazella picticaudata*, with several rodents, appear to be peculiar to the high plateaus above 14,000 feet, the two species of *Cervus* are probably found in brushwood at a rather lower elevation in the more broken regions of Eastern Tibet, where the rainfall is heavier and the vegetation more abundant.

As was pointed out in the paper in the 'Geological Magazine,' there is, so far as I am aware, no equally peculiar mammalian fauna to be found in any continental area of equal extent, and for a parallel it is necessary to turn to some island like Celebes, that has long been isolated from all surrounding lands.

3. Contributions to the Study of Mammalian Dentition.—Part I. On the Development of the Teeth of the Macropodidæ. By M. F. Woodward, Demonstrator of Zoology, Royal College of Science, London. (Communicated by Prof. Howes.)

[Received May 2, 1893.]

(Plates XXXV.–XXXVII.)

Contents.

I. Historical Review, p. 450.
II. Observations on the Specimens, p. 451.
III. General Considerations, p. 465.
IV. List of References, p. 471.
V. Explanation of the Plates, p. 472.

Early in 1892 I had placed at my disposal, through the kindness of Prof. Howes, a number of fœtal mammals of various kinds, which were for the most part derived from the late Prof. W. K. Parker's collection. I have been for some time past investigating these specimens and now submit a few of my results in this contribution.

I.—Historical Review.

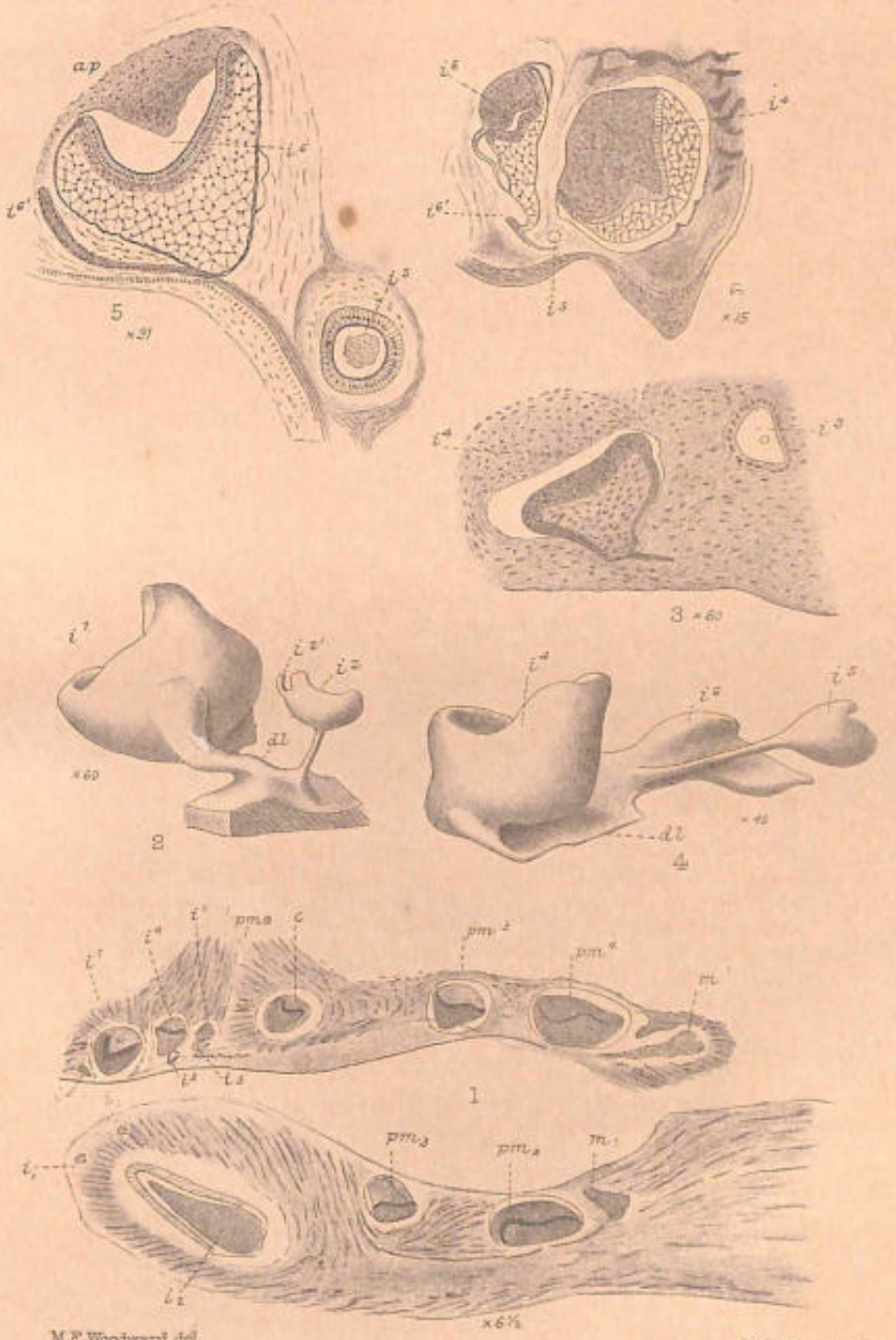
Since Kükenthal (4) published his preliminary observations on the development of the teeth of the Cetacea and of *Didelphys*, an entire revision of the science of Odontology has been necessitated. This has been taken up eagerly by many Continental observers, notably Leche, Röse, and Taecher, so that notwithstanding the newness of the study there is already springing up a rapidly increasing literature.

Most, however, of these observers have confined their attention to a few isolated examples, and no systematic examination and comparison of the tooth relationships in the various orders of Mammals, such as that commenced by Pouchet and Chabrys (9), has been attempted.

In dealing with the Marsupials these observers have mainly studied the tooth relationships of *Didelphys*, Kükenthal (5) and Röse (9) having made most exhaustive investigations of this genus.

Röse has further published some interesting but largely theoretical views of the tooth development in *Acrobates*, *Dasyurus*, *Phalangista*, and *Macropus*; while Leche (6) has published preliminary accounts of that of *Phascolarctos*, *Perameles*, *Myrmecobius*, and *Trichosurus*.

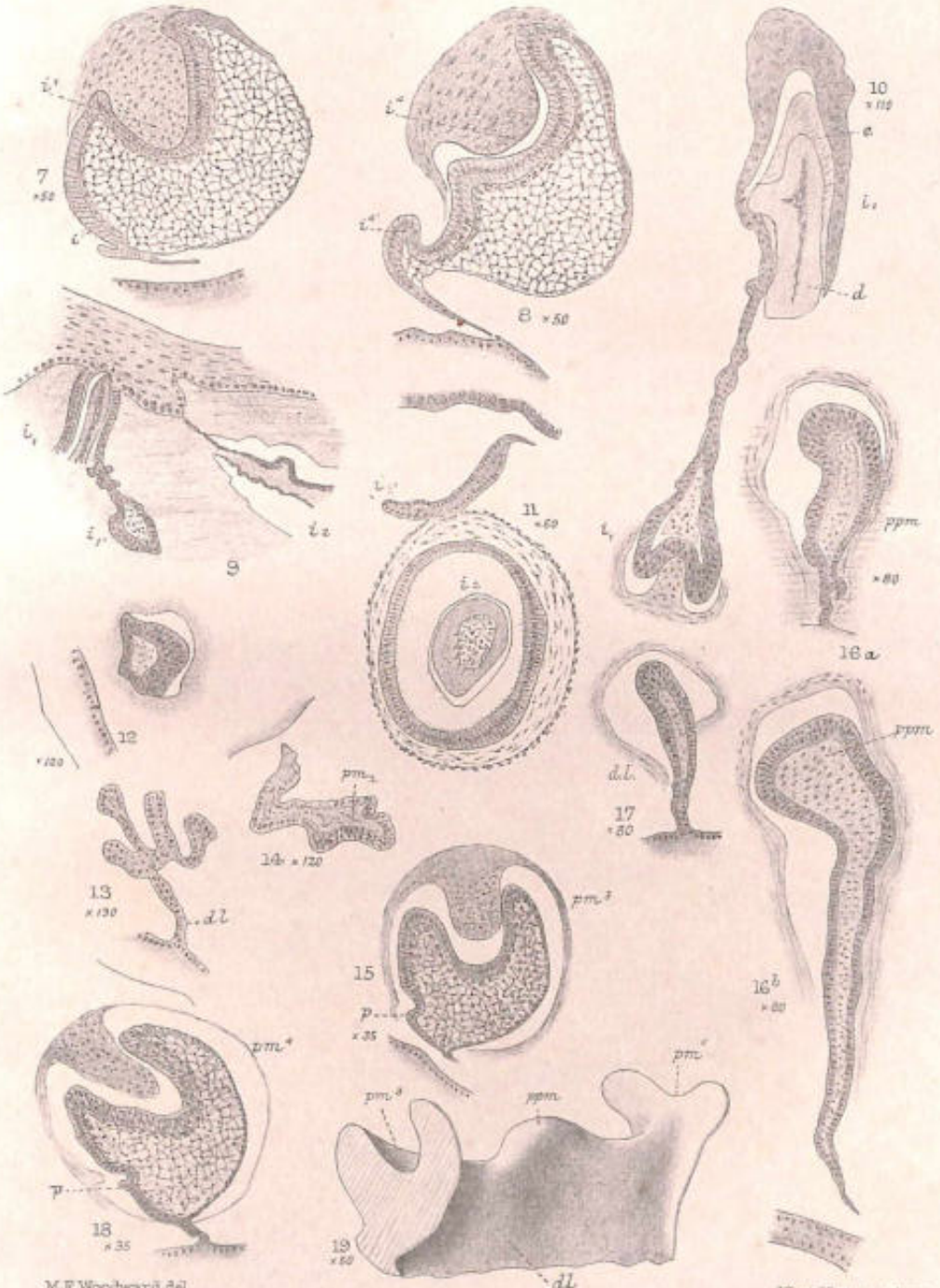
The only investigation which treats of the facts dealt with in this paper is that of Röse (9) on *Macropus*; he, however, only devotes a few lines to his observations, which were based on



M. F. Woodward, del.
M. P. Parker lith.

West, Newman imp.

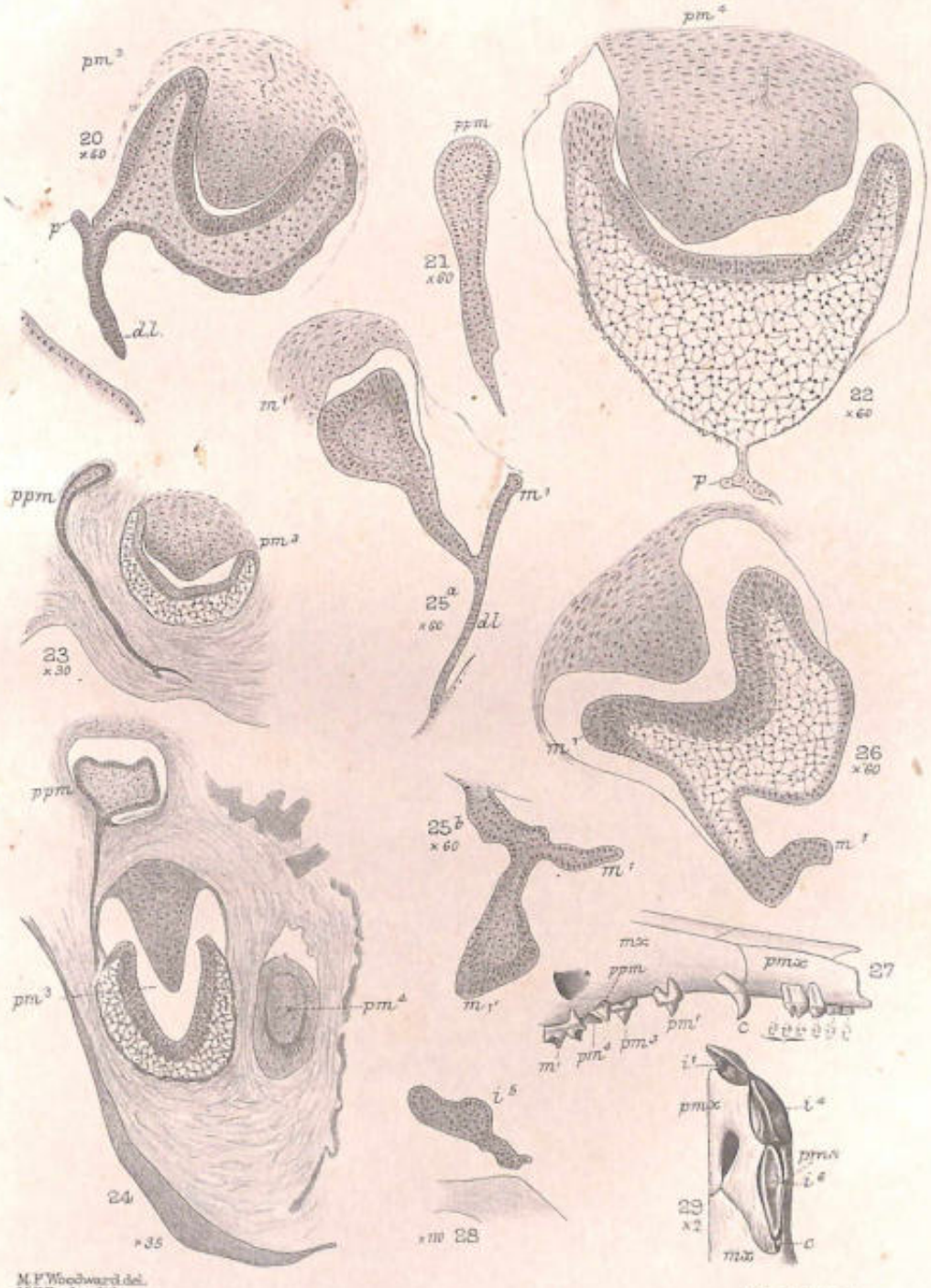
The Dentition of the Macropodidæ.



M.F. Woodward del.
M.P. Parker Lith.

The Dentition of the Macropodidae.

West, Newman imp.



M. F. Woodward del.
M. P. Parker lith.

The Dentition of the Macropodidæ.

West, Newman imp.

specimens in which the teeth were already cutting the gum and far too old, taken alone, to determine the true tooth relationships. His principal conclusion is that the 3rd incisor, on account of its lateness in cutting the gum, must belong to the 2nd dentition; this, as I shall show later, is quite erroneous.

II.—Observations on the Specimens.

Having a very fine series of Macropid embryos at my disposal, some from Prof. Parker's collection and others received through the kindness of Mr. Fletcher of Sydney and Dr. Symington of Edinburgh, I propose to commence my tooth studies with that group, as being one of which I can give the most complete account.

The following forms have been investigated:—

Macropus giganteus, 9 specimens.
" *bennettii*, 1 specimen.
" *eugenii*, 2 specimens.
" *brachyurus*, 2 specimens.
Petrogale penicillata?, 6 specimens.
" sp. inc., 2 specimens.
Bettongia lesueuri, 1 specimen.
Æpyprymnus rufescens, 2 specimens.

Unfortunately, in the case of the Petrogales I am somewhat uncertain about the species, as the embryos collected by Mr. Fletcher of Sydney seem according to his account to be *P. penicillata*, while the same name was given me by Dr. Symington for his specimen; nevertheless, I have no hesitation in saying that they are two distinct species, both, however, being Rock-Wallabies. As a rule, the exact species would not perhaps matter very much, but in this case it is a very vital matter, as the *P. penicillata* of Mr. Fletcher was the most interesting and least specialized of all Macropids with regard to its tooth arrangement, so much so that I shall commence my observations on that form.

Before proceeding to the detail observations, I should wish to enforce the importance of Prof. Huxley's method of observation by dissection under clove-oil, given in my previous paper (P. Z. S. 1892, p. 40). This method, employed side by side with examination by means of serial sections, I hold to be very important and assists one materially in interpreting the latter, although taken *alone* it may be very misleading. One may simply clarify and sketch the jaw before decalcifying and sectioning, and in this way gain a good idea as to what teeth, especially vestigial ones, are present. Or, better still, where one can afford to utilize both halves of the head of the fœtus, one can carefully dissect one half in oil of cloves and so obtain a complete model of the developing teeth (generally consisting at this stage of enamel organs only), both in relation to the gum and to the maxilla and premaxilla, while one obtains a complete series of sections of the other half.

PETROGALE PENICILLATA.

Examined 4 embryos, either by clarification or sections, or both. Specimens examined measured from snout to tip of tail respectively 8·5, 9·5, 11·5, 14·5 centims.

D. f. of adult according to Thomas (12), I. $\frac{1.2.3}{1.}$ C. $\frac{0}{0}$, P. $\frac{0.0.3.4}{0.0.3.4}$, M. $\frac{1.2.3.4}{1.2.3.4}$.

Fig. 1, Plate XXXV., represents the entire jaw clarified with the teeth *in situ*.

At this stage it will be seen that there are present in the upper jaw in all 10 teeth, 6 being in the premaxilla and 4 in the maxilla, while in the lower jaw there are only 6 teeth. In the upper jaw, only three out of the 10 were calcified, viz., i^2, i^3, i^4, fig. 1, all being situated in the premaxilla; from their minute size and advanced calcification these are obviously vestigial structures, the three functional incisors of the adult being at present represented only by their enamel-organs, of which the first two are very large (i^1 and i^4).

In the maxilla the germs of 4 teeth are present, the 1st, from its proximity to the premaxillo-maxillary suture and the large diastema which separates it from the remaining teeth, evidently represents the canine, while the others represent the 3rd and 4th premolars and the 1st molar.

In the mandible we find the large functional incisor (i_2) of the adult slightly calcified, and on either side of this a small rudimentary but well-calcified functionless tooth (i_1 and i_3); behind these we find the 3rd and 4th premolars and the germ of the 1st molar.

The Incisors.

The most striking feature in this Petrogale is the presence of three additional vestigial incisors in the upper jaw and two in the mandible,—a fact not hitherto recorded. The presence of these teeth naturally enables us to homologize the functional incisors of the adult with those of the Polyprotodont Marsupials.

Here I would direct attention to a source of error which might creep in through the examination of clarified preparations of the jaw only, for it will be seen that the 1st rudimentary upper incisor is apparently situated in front of the 1st functional one; and it was only by means of a very carefully prepared series of sections taken at right angles to the premaxilla, starting parallel with the premaxillary suture and changing the plane of the sections as one passed outwardly, so that the plane of the last section was at right angles to that of the first, that one was enabled finally to determine which of these teeth was really the 1st incisor.

Fig. 2 is a wax model constructed from a series of sections by His's method; this shows that the enamel-organ of the 1st large and at present undifferentiated tooth is connected with the gum nearer to the premaxillary suture than that of the small rudi-

mentary calcified tooth, which, although actually in front of the former, is nevertheless morphologically and in point of origin posterior to it. The 1st incisor of the adult is therefore the morphological 1st incisor, and in the younger of the specimens its enamel-organ only as yet is differentiated and appears as a great pear-shaped swelling of the dental lamina (enamel-ridge, "Zahnleiste"). In an older one measuring 11·5 cm. there was present on the inner side of the enamel-organ a slight club-shaped downgrowth, such as that described by Kükenthal and others in *Didelphys* as representing the permanent or replacing tooth ("Ersatzzahn").

The morphological 2nd incisor is a very minute calcified rudimentary (or rather vestigial) tooth measuring ·25 mm. by ·14 mm.; its enamel-organ (fig. 2, i^2) is only slightly developed and apparently, although possessing an enamel-epithelium, does not secrete any enamel; it shows a distinct but small downgrowth on its inner side ($i^{2'}$) obviously representing the ventral continuation of the dental lamina and the undeveloped permanent tooth of Kükenthal, Röse, and Leche, and according to the interpretations of these observers this small calcified tooth must be a vestigial milk-tooth. The tooth itself consists of dentine and possesses an irregular contour and a variable pulp-cavity; the relation of the odontoblasts suggest that they are concerned more in absorption than in formation of tooth-substance.

The dental lamina, after giving rise to these two teeth, disappears for a few sections, but soon reappears and swells out again to form the 2nd functional tooth, which I at first took to be the 3rd incisor. However, on investigating carefully the relation of the extremely reduced 2nd rudimentary tooth (fig. 3, i^2), it was obvious that the enamel-organ of the latter was connected with the gum slightly anterior and external to that of the former, although, owing to the large size and swollen nature of the enamel-organ of the 2nd functional incisor, part of this tooth appears in sections anterior to the rudimentary one; but the only important point to be ascertained in determining the morphological relation of teeth is not which tooth is anterior to the other, but which enamel-organ arises in front of the other from the dental lamina.

This 2nd rudimentary tooth is then the morphological 3rd incisor, the 2nd functional one being the 4th.

The 3rd incisor is, like the 2nd, a vestigial structure only present in the embryo and although possessed of an enamel-organ it has no enamel; its body, consisting of dentine, is very irregular and is obviously being reabsorbed. It is smaller and still more vestigial even than the 2nd incisor and shows no trace of any downgrowth from its enamel-organ, but from its resemblance to the 2nd incisor I conclude that it also belongs to the 1st dentition.

The remaining incisors are very interesting and present such striking relationships that they call for a very careful examination, especially in the light of Röse's statement regarding the 3rd adult incisor.

The enamel-organ of the 2nd functional incisor (morphological 4th) soon loses its connection with the gum, and the dental lamina from which it is developed does not again obtain any connection with the gum in the incisor region. The enamel-organ of this tooth is too young to show any trace of the successional tooth, although the examination of other forms (*M. giganteus* and *brachyurus*) show that it is undoubtedly to be referred to the 1st dentition.

The dental lamina, after giving rise to this tooth, is continued back as a slightly thickened lamina (club-shaped in section) into that backward prolongation of the premaxilla which is situated internally to the maxilla (fig. 29) and in which the 3rd incisor of the adult is developed; in this region it becomes once more swollen (fig. 4, i^3) to give rise to the latter tooth, which is, however, developed very late in life and therefore hardly shows at this early stage. Halfway between these two teeth and attached to the external (adamantine) face of the dental lamina is situated a very perfectly formed small, pointed tooth; this is the 3rd rudimentary tooth above referred to (fig. 1, i^3). In section this tooth is seen to be well developed, possessing the most highly differentiated enamel-organ, which secretes a thick layer of enamel, internal to which is a well-developed mass of dentine surrounding the pulp-cavity. The entire tooth measured ·4 mm. long by ·25 mm. broad. Its general structure, however, suggests that it is fully formed, and its ultimate fate is probably that of the two anterior vestigial teeth, viz., it is reabsorbed.

A very important question now arises, Do these two teeth belong to the 1st or the 2nd dentition, and also what is their numerical position amongst the incisors? In attempting to solve this point it will be well to bear in mind Röse's suggestion, viz., that the 3rd functional incisor of the adult (i^3) belongs to the second dentition and is not preceded by a deciduous tooth.

Fig. 4 represents a wax model reconstructed from the sections by means of a camera lucida. An examination of this shows that the enamel-organ of this small calcified tooth (i^3) is situated external to the 2nd and 3rd functional incisors (i^4 and i^5) and connected with the dental lamina by a long neck: its external position certainly suggests that of a milk-tooth, but on the other hand it is no more nearly related to the 3rd than to the 2nd functional incisor, being situated just about halfway between the two, so that supposing it were a milk-tooth it would be nearly impossible to say to which tooth it is related. Further, if it belonged to the 1st dentition its enamel-organ should be attached to the dental lamina nearer to the point of origin of the latter from the gum; whereas in the specimen under consideration these three teeth (i^4, i^5, i^6) all arise from the dental lamina at the same level, which suggests that they belong to the same series and not to two dentitions distinct from one another in point of time, for in that case the one belonging to the 1st dentition would arise from the dental lamina superficially to the corresponding tooth in the 2nd dentition.

If I am right in concluding that these three teeth belong to the same dentition, then the 2nd functional incisor of the adult is in reality the 4th incisor, this small calcified tooth is the 5th, and the 3rd adult incisor must consequently represent a 6th incisor. Unfortunately, although possessing several specimens of this interesting form they were all too young to show the further development of these three last incisors, and in order to completely settle the question as to the relation between these teeth I was obliged to refer to other Macropids of which I possessed older examples.

In both *Macropus giganteus* and *M. brachyurus* the second adult incisor shows a fairly well-marked rudiment of the replacing tooth in the form of a cellular downgrowth from the inner side of the neck of its enamel-organ, thus showing that this tooth itself belongs to the 1st dentition. A similar condition is observable in the 3rd functional incisor of *M. giganteus* and of *M. eugenii* (figs. 5 and 6, i^{v}), which must also be referred to the 1st dentition, and not, as Röse believes, to the 2nd. In both these forms the small calcified incisor (i^{3}) is present and situated between the two larger ones; in *M. giganteus*[1] it is extremely vestigial and only to be recognized with difficulty; but in *M. eugenii* it is, on the contrary, very large and well developed. In no case, however, did it show any indication of a replacing tooth as seen in the 1st rudimentary incisor of *Petrogale*; so that it is impossible to say for certain to which dentition it was to be referred, but, judging from its analogy with the other vestigial teeth, it should belong to the 1st dentition.

We find therefore in the upper jaw of *Petrogale penicillata* 6 incisors, three of which are very small and obviously disappearing, and three which we recognize as the incisors of the adult: these teeth are all referable to the 1st (or milk) dentition, the 1st, 2nd, 4th, and 6th all possessing at some period in their development, either in *Petrogale* or in some other allied Macropid, rudiments of the 2nd or replacing teeth.

The adult incisors are the 1st, 4th, and 6th, the 2nd, 3rd, and 5th being in a vestigial condition and completely reabsorbed almost before the former become calcified.

Röse's suggestion concerning the relation of the 3rd adult incisor (i^{3}) is not borne out by the study of its development, fig. 5 distinctly showing that in *M. giganteus* this tooth belongs to the 1st dentition, and not to the 2nd as he stated for that species. His conclusions were based solely on the fact that the 3rd incisor cuts the gum so much later in life than the anterior teeth. The explanation of this arrangement becomes self-evident when one compares the young skull (fig. 29) with that of the adult: it will be seen at once that the premaxilla is very small in the former in proportion to the teeth, and is consequently far too short to accommodate the three large incisors of the adult at the same time, the teeth being extra large for a fœtus owing to the fact that they are the adult teeth and are not replaced by a second set as in most

[1] I have since cut a younger *M. giganteus*, and find this tooth is very large; so that in the specimen above mentioned it must have been largely reabsorbed.

animals. As may be seen (fig. 29) the 3rd incisor (i^3) develops in a backward prolongation of the premaxilla situated on the palatal side of the maxilla and side by side with the canine, and only attains its true position in very advanced pouch-specimens.

The overcrowded state of the jaw will further explain the complete atrophy of the already reduced 2nd, 3rd, and 5th incisors. And to the same cause we may, I think, ascribe the abnormal position of these teeth having become displaced by the larger ones till they have assumed a position with regard to the latter which suggests the relation between teeth belonging to the 1st dentition and their successors in the 2nd dentition.

The true reason for the small size of these teeth is probably to be found in their disuse together with an early enlargement of the 1st and 4th incisors. This last character would according to Cope's mechanical theory (2) be enough to account for their entire disappearance; he suggests that the enlargement of any organ causes the abstraction of the growth-energy and material from some adjacent structure, as in the case of the enlarged canines of the Wart-hog causing a reduction of the upper incisors. In trying to account for these reductions in the number of teeth every feature which can possibly bear on the case should be taken into consideration, as it is more probable that a number of factors have acted together to bring about these results, rather than they can be accounted for by one only. It is interesting to note in the light of Cope's suggestion that in this Petrogale, where we find a greater number of these vestigial teeth than in any other Macropid which I have examined (except *M. giganteus*), the adult incisors are of a much slighter nature than in the latter forms, where some of these vestigial teeth have either completely disappeared or if present have become much reduced. I think that the presence of these additional teeth is to be explained rather on the above grounds, than on the supposition that *Petrogale penicillata* is an extremely primitive form.

The presence of the remains of six pairs of upper incisors is altogether unexpected and rather unfortunate, for one would hardly expect to find in so specialized a family as the Macropodidæ more incisors than are present in the least specialized Polyprotodonts. In these latter forms with their 5 upper incisors, however, the premaxilla in the fœtus is very much crowded, more so than in *Macropus*. As the teeth in the former all develop at the same time, whereas in the latter, as we have seen, they develop progressively from before (backwardly), this may perhaps account for the suppression of the 6th incisor. Judging from the condition of the adult in *Perameles*, I should imagine that the first incisor to disappear was number 5, as there is a large diastema in the adult between the 4th and 5th incisors. This suggestion was further strengthened by the study of a series of sections through the jaw of a young *Perameles*, while the premaxilla was still short and consequently crowded with teeth: at this stage a slight but definite thickening of the dental lamina (fig. 28) was observable between

incisors 4 and 5, in the position of the rudimentary incisor 5 of *Petrogale* and of the large diastema in the adult *Perameles*, and this possibly represents a 6th incisor. From this I conclude that the Marsupials originally possessed 6 pairs of incisors in the upper jaw, the first of which to disappear being no. 5 in the Polyprotodonts, while in the Macropodidæ nos. 2, 3, and 5 are wanting; here, however, no. 5 is less reduced than nos. 2 and 3, this being due to the fact that the large functional incisors nos. 1 and 4 develop early and consequently cause a corresponding early absorption of nos. 2 and 3, while owing to the late development of no. 6 the small no. 5 persists for a considerable period.

The Lower Incisors.

In the adult *Petrogale* and in all the Macropodidæ there is but one incisor in either half of the lower jaw, which tooth according to Thomas is to be identified either with no. 1 or 2 of the Polyprotodonts.

In the young *Petrogale* there are, however, no less than three teeth situated close on either side of the mandibular symphysis. Fig. 1 shows one set of these teeth *in situ*: it will be seen that two of them (i_1 and i_3) are very small although fully calcified, consisting even at this early period of both enamel and dentine. The remaining one is very large and may be shown to be the developing single incisor of the adult. The position of the two minute teeth close the tip of the large incisor (i_2) shows the former to be undoubted incisors.

The examination of a series of sections through the mandible showed that the most anterior of these three teeth is the minute tooth i_1, fig. 9, and we may call this tooth provisionally the first lower incisor. This tooth is so well calcified that, in spite of its small size, we must conclude that it is fully formed, and from an examination of a series of stages I have come to the conclusion that it does not cut the gum but is probably reabsorbed. One of the most interesting points in connection with this tooth is the fact that from the posterior or internal side of its enamel-organ there arises a long cord-like downgrowth with an enlargement on its deep-seated extremity (figs. 9 and 10, i_1), which at a later stage becomes slightly indented below, and has all the relations of an undeveloped permanent tooth. This small vestigial incisor (i_1) is thus proved *to belong to the* 1*st dentition*; and this fact further clears up any doubt which might exist as to its relation to the functional incisor (i_2), to which it is very closely approximated, but to which it is in no way related.

Judging from the analogy of the other incisors, I should conclude that the functional incisor also belongs to the 1st dentition, but I have not been able to trace any very definite downgrowth from the inner side of its enamel-organ in this species.

The 2nd small tooth (i_3) (? morphological 3rd incisor) is more vestigial than the first, and shows no trace of a successionalt ooth,

so that one can only suggest by a comparison with the 1st of these teeth that it is to be referred to the 1st dentition.

The Canines.

Owen (p. 291) and Flower have already pointed out the existence, in the mammary fœtus and the adults of some Kangaroos, of vestigial upper canines, so that their presence here in all the Macropodidæ (save *M. brachyurus*) which I have examined calls for no special comment.

The dental sac of this tooth is of considerable size and situated close to the premaxillo-maxillary suture, a considerable space intervening between it and the premolars behind.

In the dried skull (7 cm. long) of an advanced mammary fœtus of *Petrogale xanthopus* the canine was present on either side as an exceedingly minute pointed tooth in a distinct alveolus (fig. 29, *c*)[1]. It seems probable that this tooth is shed, not reabsorbed, being pushed out of the gum by the development of the enormous 3rd incisor which is situated immediately internal to it.

There is no trace of a lower canine in any Macropid which I have examined.

The Premolars.

The dental lamina is more or less continuous between the canine and the most anterior upper premolar (pm^3), but at the same time it is very irregular, showing several curious swellings (fig. 12); these, however, are so irregular that I hesitate in ascribing any importance to them, but it is just possible they may represent the missing 1st and 2nd premolars.

The 3rd premolar (fig. 1, pm^3) shows as a fair-sized dental sac with a well-developed enamel-organ and pulp, but at present there is no trace of calcification, its enamel-organ remains attached to the small dental lamina whose free end projects slightly into the surrounding tissue (fig. 15); this structure, which might possibly be interpreted as a rudimentary successional tooth, disappears as we trace this tooth backwards in the sections, and soon also does the swollen portion of the enamel-organ of the 3rd premolar itself, but in its place, and directly continuous with it, we find a strongly developed club-shaped mass of cells which run in form of a lamina between the 3rd and 4th premolars, connecting their enamel-organs and bearing a definite swelling in the middle (fig. 19, *ppm*). A section through this region shows (fig. 16) that we are dealing with an incipient enamel-organ, the centre of which is already differentiated into the typical stellate tissue.

The 4th premolar, which is very large though not calcified, is still connected by the dental lamina with the gum, but shows no trace of a successional tooth unless the small process of the enamel-organ (fig. 18, *p*) be interpreted as such.

In a slightly older embryo the same condition was observed, but owing to the development of the 3rd and 4th premolars, especially

[1] In fig. 29 the canine is represented as lying in the suture between the premaxilla and the maxilla, in reality it is surrounded by a thin layer of the latter.

of the latter, they somewhat overlap the lamina connecting the two and it in consequence becomes displaced to the inner side of these structures. So much does the 4th premolar grow forward with age that it appears as if this lamina was a downgrowth from the inner side of the enamel-organ of pm^4; this, however, is really not the case, the lamina is morphologically in front of that tooth and only attains a secondary connection with it.

A careful examination of the swollen part of this lamina (fig. 16, *b*) at this more advanced age shows that we are undoubtedly dealing with a developing tooth. Now the only tooth which develops in this situation is the one successional or replacing premolar of the Marsupials, and this is usually regarded as being the derivative of the 4th premolar, which latter, as far as I have observed, in *Petrogale* never develops a successional tooth at any time. The successional tooth is here developed from a dental lamina situated between pm^3 and pm^4, but may afterwards attain a secondary connection with the latter tooth, but does not represent its true successor. The facts appear to me to strongly suggest that this tooth represents a premolar belonging to the same series as pm^3 and pm^4 which has been retarded in its development and in consequence does not cut the gum until long after the others. The further consideration of this point I shall leave till I have described the condition in the other Macropids here dealt with.

The condition in the lower jaw is the same as that in the upper.

The Molars.

While investigating the condition of the developing molars in the Kangaroos I naturally sought to confirm Kükenthal's suggestion that the molars belonged to the first dentition; this, however, I have been unable to do. In fact, if any reliance is to be placed on these downgrowths from the enamel-organs of the developing teeth or from the dental lamina, then I must assert that the 1st and 2nd molars of the Macropodidæ belong to the 2nd dentition, and that therefore Kükenthal's original suggestion does not hold good for the Marsupials in general.

The great difficulty which we find in connection with the interpretation of the molars arises from the shortness of the jaws, so that according to the age we find the most posterior molar as yet formed developing side by side with the penultimate one. This led Kükenthal into a mistake, which he has since pointed out to me. In his paper (no. 5) he figures the 2nd molar of *Didelphys* with a rudimentary successional tooth; this is really, as he now believes, the rudimentary 3rd molar developing side by side with the 2nd. He, however, describes what he believes to be a trace of a successional tooth in connection with the 1st molar, but unfortunately he does not figure this structure. I have found no trace of any such structure either in *Didelphys* or in Macropodidæ, and therefore see no reason to believe that the molars are in any sense referable to the 1st dentition.

On the other hand, sections taken across the jaw of *Petrogale*,

through the region of the 1st molar at two stages, show (fig. 25) that there is present on the outer side of the enamel-organ a conspicuous outgrowth of its cells extending down into the gum at right angles to the swollen portion of the dental lamina. This mass takes its origin from the dental lamina nearer to the surface of the gum than the point of origin of the molar tooth, which condition is apparently just the reverse to that which we have seen in the incisor region, where, if there was a rudiment of a second set of teeth, it was situated internal to, and deeper than, the functional one, and represented a replacing dentition. Here in the molar region, on the other hand, we can only interpret these appearances on the grounds that the functional molars belong to the 2nd or replacing dentition, and that this downgrowth on their outer sides represents the rudimentary, or rather vestigial, milk or 1st dentition. I may perhaps mention here that I have found what appears to be a similiar condition in *Putorius* and *Cavia*, while in *Lepus* and *Talpa*, where there is a suggestion of the reverse condition, we are in reality dealing with the dental lamina itself and not a downgrowth from it, as may be seen when the more posterior sections are examined.

The second species of *Petrogale*, which was evidently the more advanced embryo of a smaller form, showed only two vestigial upper incisors, these having the relation of i^2 and i^3, and one only in the lower jaw, viz. i_1; it may be that $\frac{i^2}{i_2}$ were already reabsorbed.

Macropus brachyurus.

Two specimens examined, measuring respectively 100 mm. and 135 mm.

These specimens, although so small, were very much older than the Petrogales described above, *Macropus brachyurus* being one of the smallest Wallabies: the teeth were in consequence much more highly developed.

Only two vestigial teeth were present in each premaxilla, corresponding in position with i^2 and i^3: the former was of considerable size and so close to the surface of the gum that it is just possible that it is shed in this form; the latter was, on the other hand, very small and already partially absorbed.

The three functional incisors (i^1, i^4, and i^5) all exhibit slight but distinct downgrowths from the inner side of their enamel-organs representing rudiments of the successional teeth, according to Kükenthal's theory, and are therefore, as in all Macropids, referable to the 1st dentition.

In the lower jaw there are present 2 pairs of incisors representing i_1 and i_2. The first being a vestigial tooth but of fair size and well calcified; the second is the large incisor of the adult and shows an epitheloid cord on its inner side representing the successional tooth.

No trace of a canine was visible in either jaw of this specimen, the anterior premolar, which is here very large, coming close behind

the premaxillo-maxillary suture (incisor fissure). The condition of the premolars is very interesting. In the younger of the two specimens examined, the rudiment of the successional tooth is developed very much as in *Petrogale*, that is in the interspace between pm^3 and pm^4, but it is much closer to the former, with which it is connected, and has no connection whatever at this stage with the latter; the difference may be, however, due to the fact that this is a slightly older stage than that described for *Petrogale*. In the second stage this rudiment of the successional premolar is much more differentiated, and owing to the development of pm^3, which is here very large, it comes to be under the posterior end and on the inner side of this tooth, with which we have seen it is undoubtedly connected.

One thing we may say for certain, that in *M. brachyurus* the solitary successional tooth is not developed in connection with pm^4, but either represents a tooth in between pm^4 and pm^3 or else is the successor to the penultimate premolar (pm^3).

The relation of the premolars in the lower jaw is the same as that in the upper.

Macropus eugenii.

Two specimens, 125 mm. long.

In this species there are present in the upper jaw 5 pairs of incisors, corresponding with i^1, i^2, i^4, i^5, and i^6 of *Petrogale penicillata*; and, as in that form, i^1, i^4, and i^5 are the functional adult teeth, while i^2 and i^3 are vestigial structures. No trace of that very rudimentary tooth i^3 could be found. Of the rudimentary teeth i^2 is very small, this being in all probability due to the fact that the first functional incisor here early attains a large size, and has consequently further dwarfed the disappearing i^2. On the other hand, i^3 is a very prominent and well-developed tooth (fig. 5), and in conformity with this we find that i^6 is at present very slightly developed and quite uncalcified.

A transverse section across the jaw and passing through i^3 and i^6 is shown in fig. 5, and it will be seen there is a well-developed downgrowth from the inner side of the enamel-organ of i^6, showing that this latter tooth, like i^1 and i^4, belongs to the 1st dentition, the downgrowth ($i^{6'}$) representing the rudimentary permanent tooth. The small tooth i^3 is therefore quite an independent tooth, and probably represents the 5th incisor of the first dentition.

Of the first lower incisor (i_1) no trace was observed in this species; the second and functional incisor was large and calcified, and exhibited a large and definite rudiment of its successional tooth in the form of a thick cord-like downgrowth from the inner side of its enamel-organ, this rudiment being more definite here than in any other form I have examined.

The upper canine is a small tooth situated in the maxilla and close to the last incisor; it shows no indication of a successional tooth, nor in any form which I have examined can one say

definitely to which dentition this tooth is to be referred. Between the canine and the premolar the dental lamina branches out in a most curious way, in some sections exhibiting three or four down-growths from its adamantine face (fig. 13). Whether these represent modifications of the missing premolars 1 and 2 I am unable to say, but it is interesting to note that a somewhat similar condition of the dental lamina was observed in *Petrogale* in the same region.

The anterior premolar (3rd) is present in the form of a long tooth-germ, which does not as yet show the formation of any dentine or enamel. A careful examination of a complete series of transverse sections revealed on the inner side of this tooth a long cord of epithelium whose neck was anteriorly and superficially connected with the dental lamina at the point of origin of the 3rd premolar (fig. 23, *ppm*), while posteriorly its deeper-seated extremity or bulb was swollen and situated rather behind and deeper in the gum than this tooth. This structure entirely disappears from the sections before the 4th premolar is reached, thus showing that it is situated anteriorly to the latter, with which it at no time shows any connection.

The same condition holds for the lower jaw save that the bulbous portion of this epitheloid cord (*ppm*) grows backward from its point of origin into the space between the two premolars and eventually attains a situation by the side of the 4th premolar, but it never has any connection with the latter, and its posterior position as compared with the same structure in the upper jaw is probably due to the backward extension of the great lower incisor, which takes up all the room under the 3rd premolar, so that this developing premolar is backwardly displaced until it attains a position under the 4th premolar.

The 4th premolar is a very large and well-developed tooth, the largest in either jaw at the stage, and possessing well-developed calcified cusps. It shows *no signs of a vertical successor* at either of the two stages which I have examined in this species.

The molars were in both specimens too advanced to show the vestiges of the other dentition, so I was unable to determine to which set they should be refered.

Macropus giganteus.

Material consisted of 8 pouch-specimens, a very complete series, youngest about 155 mm. long (this specimen was a little older than the largest Petrogale examined).

In the youngest specimen there were three rudimentary incisors present corresponding to those in *Petrogale*, but in all the older ones i^2 had disappeared and both i^2 and i^3, which were very large to begin with, had now become through absorption very much reduced. These three teeth have precisely the same relation and origin as in *Petrogale*, and so call for no further description. All three functional incisors, viz. i^1, i^4, i^5, show at one stage rudiments of their representatives in the second dentition (figs. 6, 7, 8). The first

lower incisor is present as in *Petrogale* with a rudimentary successor, the functional incisor being i_2, and shows a distinct indication of its successor in the second dentition (fig. 11, $i^{2'}$); no trace of i_1 was observed.

The canine is large and late to calcify, being uncalcified in the largest specimen examined, of which the head measured 83 mm.

In the diastema between the canine and the 3rd premolar, the dental lamina presents numerous small enlargements and irregularities, some of which possibly represent the missing premolars. In the lower jaw, however, there is a very distinct vestige of a tooth in the form of an irregular enamel-organ with enamel-epithelium and pulp (fig. 14). This, from its proximity to the 3rd premolar, must represent pm_2.

The one functional successional premolar in the youngest specimen examined is developed as an enlargement of the dental lamina between pm^3 and pm^4 (fig. 21), being continuous with the slight downgrowth developed on the inner sides of those teeth (figs. 20 and 22). In this respect it differs slightly in origin from that of *Petrogale*, where it was directly continuous with the enamel-organs themselves, and not with any internal lamina; this may be due to the specimen under consideration being older than the *Petrogale*, as even in that form this tooth subsequently takes on this internal position.

These two slight downgrowths (figs. 20 and 22) may perhaps represent rudimentary permanent teeth, in which case the two functional premolars must both be regarded as belonging to the first dentition.

In the older specimens the successional premolar subsequently takes on a position internal to the posterior end of pm^3, and loses its connection with pm^4, with which its connection was at the best very slight.

In the youngest specimen the 1st molar above and below was just formed, and while the lower one showed no indication of any accessory tooth rudiment, the upper one (fig. 26) had exactly the same relationas seen in *Petrogale*; that is, a downgrowth of epitheloid cells from the dental lamina external to and nearer the gum than the molar itself. This, as I have before pointed out, must be regarded as a vestige of the 1st dentition, and the molar teeth, at any rate the 1st, must be regarded as belonging to the 2nd dentition.

Macropus bennettii (ruficollis).

One very badly preserved head. This, when clarified, showed that there were present in the premaxilla 5 incisors, the three functional being i^1, i^4, and i^5, and the two vestigial ones being i^2 and i^3.

The dried skull of a very advanced pouch fœtus showed that the canine was very large for a Macropus and calcified, and I should think in all probability cuts the gum and is shed, not reabsorbed. The first specimen was too much macerated to make out any detailed tooth relationships, and I only mention it here to show how constant is the presence of at least two of these vestigial incisors (viz. i^2 and i^3).

Æpyprymnus rufescens.

Two specimens, measuring 125 mm. and 195 mm. long respectively.

In this Kangaroo-Rat no trace of the reduced incisors was observed, the three functional ones being well developed, the first and the last showing traces of an internal downgrowth from the dental lamina similar to that seen in the true Kangaroos.

The jaw is here very short, so that the last incisor, the canine, and the anterior end of the first premolar appear in the same section. The last-mentioned tooth is very large and extends through a great number of sections; towards its posterior end, and just as the 4th premolar is appearing on its external side (fig. 24), a mass of cells is noticed lying above it; this mass of cells is connected with a long epitheloid cord which is applied to the inner side of the dental sac of the 3rd premolar[1], the two having very much the same relation as that seen between the dental sac of a milk-tooth and its so-called permanent successor.

The condition seen in the lower jaw is very similar to that in the upper, except that the swollen portion of the germ of the so-called successional tooth is situated rather farther back, as in most other Macropids, owing to the backward extension of the large incisor.

If one was able to study the development of the functional successional tooth in this form only, one could not help concluding that it was developed side by side with the 3rd premolar, and that it really represented the successor of that tooth and not that of the 4th premolar as has generally been believed hitherto.

Bettongia lesueuri.

One embryo, about 180 mm. long.

The teeth of this fœtus were in an advanced stage of calcification and no traces of the supposed rudimentary successional teeth were to be observed.

There were four pairs of incisors present in the upper jaw, viz. i^1, i^4, i^5, and i^6; of these the first two and the last were very large, while i^5 was minute, somewhat irregular, and undergoing absorption. All traces of i^2 and i^3 had disappeared. No trace of additional incisors was observed in the lower jaw.

The upper canine in these Kangaroo-Rats persists in the adult as a large tooth, and in conformity with this we find that in the embryo this tooth is larger than in the true Kangaroos and well calcified. The 3rd premolar is very large, and already shows its characteristic shape, it overlaps the canine in front and nearly reaches the 4th premolar behind. The one successional tooth is of considerable size and slightly calcified; its enamel-organ is connected by a long strand of epithelium with the extreme posterior

[1] In the figure the cord of epithelium connected with the developing premolar (*ppm*) is represented as coming into too intimate connection with the enamel-organ of the 3rd premolar; it should in reality be only applied to the side of that structure, and not fused with it as appears from the drawing.

end of pm^3, the tooth itself being situated above the anterior end of pm^4, but is in no way connected with the latter. The specimen was, however, too old to show the true origin of this tooth.

The molars were too advanced to show any indication of their lost predecessors or otherwise. Of course the most posterior molar in the jaw was still very young, but as a matter of fact no traces either of predecessors or of successors have been observed to any but the 1st molar, the rest seemingly being too much modified.

III.—General Considerations.

We have seen from the above that many of the Macropodidæ possess vestiges of the five upper incisors of the Polyprotodonts, and that in two cases, viz. *Petrogale penicillata* and *Macropus giganteus*, there are traces of no less than six of these teeth, the full upper incisor formula being, 1.2.3.4.5.6. That the three adult incisors are the 1st, 4th, and 6th; this conclusion is at variance with that of Oldfield Thomas (**11**, pp. 454 and 457), who shows, in a diagram illustrating the relations between the teeth of the Polyprotodonts and Diprotodonts, that he believes the reduction in the number of the incisors in the latter to have been brought about by a suppression of the two posterior teeth of the former. This interpretation I have shown, by the discovery of vestigial teeth, to be erroneous, the teeth which disappear being incisors nos. 2, 3, and 5.

The discovery of 6 pairs of incisors, although an absolute fact, is in many respects an unfortunate one, as we know of no adult Mammal with so many, and even amongst Reptiles many Lizards and Crocodiles have the number of teeth in each premaxilla restricted to five. I can only suggest in explanation that in *Petrogale*, where the 3 adult incisors are so slight, and where there is in consequence more room in the premaxilla, the additional incisor, which is only apparently lost in the Polyprotodonts (see *ante*, p. 456), has reappeared as a calcified tooth owing to the greater amount of room in the jaw and the lesser abstraction of growth-energy on account both of the smaller size of the adult teeth and of the very late development of the most posterior incisor.

In *Macropus giganteus* only the late calcification of the functional teeth can be supposed to account for the presence of so many vestiges, and as a fact we notice, directly these adult teeth begin to calcify, the vestigial ones become reabsorbed.

The incisor which I regard as wanting in the Polyprotodonts is the 5th incisor of *Petrogale*, for I have found what appears to be an undeveloped enamel-organ in *Perameles*, between incisors 4 and 5 of that form, and corresponding in position with the large diastema of the adult. On one side of the upper jaw of an adult *Perameles* in the Teaching Collection of the Royal College of Science there is a curiously elongated tooth, occupying a position intermediate between incisors 4 and 5, both of which are wanting;

this tooth (fig. 27, i^4, i^5, i^6) shows indications of at least three fangs, and is obviously a fusion of these teeth. It seems to me probable that the partial calcification of this missing incisor might cause the fusion of these two teeth, which are only separated by a slight interval in the fœtus.

The comparatively large size of the vestigial 5th incisor in the Macropodidæ is obviously accounted for by the late development of the 3rd adult incisor, whereas the 2nd and 3rd, which are functional teeth in the Polyprotodonts, have been dwarfed by the early development and large size of the 1st and 4th incisors. The commencing enlargement of the 1st incisor is well shown in *Didelphys*.

With regard to the lower incisors, evidence is wanting to show which of the Polyprotodont's teeth these represent. The close approximating of the four lower incisors of *Didelphys* does not prove necessarily that the missing tooth is the 5th incisor, for we have seen that in the upper jaw of *Macropus* no diastemata remain to show where the suppressed teeth were situated. Nevertheless, we may provisionally allow that this is the case, and regard the three lower incisors of *Petrogale* as representing the 1st, 2nd, and 3rd, the 1st and 3rd being vestigial. The great functional lower incisors of the Macropodidæ are therefore the over-developed 2nd incisors.

Cope (2) has shown that in all probability this is also the condition in the Rodentia, there being strong evidence to believe that the single pair of large lower incisors are the 2nd; the 1st and 3rd have first become reduced as in *Esthonyx*, then the 3rd have disappeared, and the 1st is smaller than the second, as in *Psittacotherium* or in *Calamodon*, where the 1st has disappeared, which form Cope regards as the ancestor of the Rodentia.

From the study of the development of the incisors we have seen that in connection with the 1st, 2nd, 4th, and 6th above, and the 1st and 2nd below, rudimentary successional teeth ("Ersatzzähne") are to be found at one stage, thus proving that the teeth enumerated above are present in some form or other in both dentitions, and that the three incisors above and the one below in the adult, belong to the 1st, or milk dentition. This is in perfect accord with Kükenthal's (5) observations on the incisors of *Didelphys*, all of which he shows to belong to the 1st dentition. In no case have I been able to determine as to which dentition the canine is to be referred. In *Didelphys*, however, Kükenthal saw something which he considered to represent a rudimentary successional tooth, but it was evidently, from his description, very slight.

Only in *Macropus giganteus* have I been able to find any certain trace of the missing premolars; in this case the tooth found was probably pm_3. In the other forms the dental lamina was invariably present in this region, and often presented irregular swellings but nothing definite. This appears to me to be strange, as in *Petrogale* there is a large diastema, even in the young animal, between the

canine and the third premolar, so that one might reasonably expect to find some trace of these teeth; in *M. brachyurus* and *M. eugenii*, however, the anterior premolar (pm_3) was much more advanced in its development and consequently the diastema was much smaller.

I account for the absence of these teeth by the early enlargement of pm_3 before the maxilla is elongated, and in consequence this tooth overshadows the region of the 1st and 2nd premolars and abstracts the matter and power of growth which would otherwise fall to their share.

Kükenthal, in his description of the premolars of *Didelphys*, describes what he considers to be a rudiment of the successional tooth as attached to the enamel-organ of the 1st premolar, but he found no trace of the missing premolar, nor any rudiment of a successional tooth to the 3rd premolar, while he describes the functional successional tooth as being developed from the enamel-organ of the 4th premolar. Now my investigations among the Kangaroos show that in them the one functional successional tooth is never by any chance developed from the 4th premolar, and although it displaces that tooth along with the third, it is not the representative of the same (the 4th pm.) in the 2nd dentition. If this is the case, then the conclusions of Owen, Gervais, Flower, and Thomas break down as far as the Macropodidæ are concerned.

Having shown that this tooth is not the successor to the 4th premolar, it remains to decide if possible what its real significance is. Judging from its relation as seen in *Æpyprymnus* alone, I should have concluded that it really represented the successor of the 3rd premolar; but the embryos of this form and also those of the various species of *Macropus* which I have examined were all too old to show the actual origin of this replacing tooth.

The only form in which I could observe the first origin of this so-called successional tooth was in *Petrogale*, and here, as I have described above, this tooth arises independently of the 3rd and 4th premolars from the dental ridge connecting these two teeth. Its position there certainly suggested that it represented a tooth intermediate between the 3rd and 4th premolars, and belonged to the same series as themselves, owing its subsequent position internal to and deeper in the gum than these teeth to the more rapid growth and earlier development of the latter, whereby this intermediate tooth is displaced and retarded, so that it assumes all the relations of a tooth of the second dentition. The first stage in this change is well seen in the youngest embryo of *M. giganteus*.

This tooth often takes on a secondary connection with the adjacent premolars; thus in *Petrogale* it becomes connected with the 4th premolar, while in *Macropus* and *Æpyprymnus* it is related to the 3rd.

It is interesting to note that in *Perameles* the large supposed successional tooth is quite distinct in origin from the small 4th premolar which is shed; it is in fact formed from the dental

lamina situated immediately behind pm. 3, and morphologically in front of the 4th premolar. Further, if a skull be examined in which the tooth-change is taking place, it will be seen that the supposed successor of the 4th premolar cuts the gum in front of that tooth to which it is believed to be its milk predecessor (fig. 27). This would be quite an anomalous condition, for if we study the relations of a milk-tooth to its permanent successor in a typical placental mammal, we find that the latter is invariably developed behind the former, and either cuts the gum internal to it, as in the case of the incisors, or else comes up underneath it, but at the same time slightly internal and posterior. But in no case (unless the present instance in the Marsupials be one) does the permanent tooth develop and cut the gum in front of its milk predecessor.

Kükenthal, it is true, figures what he regarded as the developing functional successional tooth as arising from the 4th premolar. If this structure really has the significance which he ascribes to it, then I should suggest that he is probably dealing with one of those modified conditions seen in the later stages of *Petrogale*, in which the successional tooth has acquired a secondary connection with the tooth behind it (*pm* 4), as I think it unlikely that these two forms should possess such striking differences in the development of their teeth.

Unfortunately the specimens of *Didelphys* which I have at present examined have been too old to show the earliest stage in the formation of this tooth.

The fact that the successional tooth does actually replace the 4th premolar in these two forms is of course a strong argument in favour of the older view that these two teeth represent the milk and permanent stages of the 4th premolar; but still I think the facts of development as described above, which suggest that the older view is erroneous, cannot be ignored. Until, however, further proof is forthcoming as to the development of these teeth in the Polyprotodonts, it will not be wise to express too definite an opinion on the matter; but I nevertheless think the true explanation of the condition of these teeth in the Macropodidæ is that this so-called successional tooth is not a successional tooth at all, or at any rate to the 3rd and 4th premolar, but a tooth of the same series intermediate in position between the two.

Assuming the belief in the disappearance of the first two premolars in the Macropodidæ to be the correct one, then we must be here dealing with an animal possessing five teeth of the so-called premolar series, the tooth which is generally regarded as the successor to the 4th being itself the true 4th premolar, and the so-called 4th premolar being in reality the 5th, or else the 1st molar, which seems possible when we compare its form with that of the true molars. The presence of five premolars, considered in the light of the dentition of the higher Mammalia, may seem to be open to question. But should we not rather seek for an explanation of order and succession of the Marsupials' teeth

amongst those most lowly animals the Mesozoic Mammalia, rather than amongst the highly modified Placentalia?

If we turn to the published accounts of these old mammals, we find that many of them possessed a large number of cheek-teeth, which were in some cases divisible into two series: thus, in *Amphilestes*, where there were 12 or 13, the anterior six can be separated from the posterior ones by their simplified structure. In many cases, however, no sharp line can be drawn, as the anterior teeth become gradually more complicated as we pass backward. It is important to note that in the reduction in the number of these teeth which takes place in some (as in *Phascolotherium*), it is obvious that this has not occurred so much at the posterior end of the series, but rather that certain teeth in the middle have been either completely suppressed or retarded, thus reducing the number of teeth, especially in the premolar region.

Supposing the cheek-teeth in the Marsupials all belong to the same set, either the 1st or 2nd dentition, then the only difference between the molars and premolars comes to be one of form; and I see no reason why we should restrict the number of the latter to four, when in so many of these fossils and even amongst the living forms, viz. *Myrmecobius* (where no replacing tooth is known), we find that there may be 5 or 6 of the anterior cheek-teeth of simpler character than those behind. The so-called successor to the 4th premolar I regard as one of these anterior teeth (possibly the 4th or the 6th) which has been retarded in its development, and, by the backward growth of the tooth in front and the forward growth of the tooth behind, has assumed a position underneath these teeth, and has consequently to displace one of them in order to reach the surface. Thomas has shown the presence of this tooth in *Triconodon* under the 4th cheek-tooth, and has on this account restricted the number of the premolars to four in these early Marsupials; but this form possesses a dentition in which the number of teeth is already greatly reduced, only possessing 7 or 8 cheek-teeth, and consequently differing very little from the least modified Marsupials such as *Phascologale*. There is, I believe, no evidence to show that this condition had been acquired by forms like *Amphilestes*, with numerous cheek-teeth, unless what appears to be a retardation of the 5th cheek-tooth in forms like *Amphitylus* and *Dryolestes* is to be interpreted in this light. This tooth, however, is regarded as the 1st molar in these forms.

As I have already pointed out, the evidence adduced for the development of the premolars is not decisive enough to settle definitely to which dentition these teeth are to be referred, *M. giganteus* being the only one which shows anything like rudiments of a second set. If they belong, as Kükenthal suggests, to the 1st dentition, then I should be inclined to think that Baume's (1) theory as to the formation of the permanent teeth was not so far wrong after all (of course I leave out of consideration the Cetacea, for which Kükenthal has definitely proved the contrary). May

not this retardation of the 4th premolar as seen in the Macropodidæ be the first step in the formation of the permanent set[1], which may afterwards take on a secondary connection with the teeth of the 1st dentition? In *Amphilestes* there are 12 or 13 cheek-teeth present, and no evidence of the presence of two sets of teeth. May not the five posterior ones represent the five molars (*Bettongia*), while the first 8 might be supposed to give rise to the 8 premolars (4 milk and 4 permanent), and by the retardation of each alternate one the condition in the Placentalia might be brought about, the 2nd, 4th, 6th, and 8th being retarded and displaced to form a second or replacing set, whilst the 1st, 3rd, 5th, and 7th develop early and are replaced by the former? These teeth, which were originally distinct, may have acquired a secondary connection with the tooth in front, as seems to have been the case with the 3rd premolar of the Kangaroos and the one replacing tooth, this latter in those forms displacing both the 3rd and so-called 4th premolar. In others it, however, only displaces the so-called 4th premolar, owing to the latter having, through its enlargement, acquired a connection with the replacing tooth, as in *Didelphys*; or, owing to the reduction in size of the 4th premolar, as in *Perameles* and *Thylacinus*, the supposed replacing tooth is able to cut the gum in its more normal position and displaces the reduced tooth behind.

If these various and often minute cord-like downgrowths of the dental lamina are to be interpreted as representing rudiments of teeth, as seems probable from comparison with the known rudiments of the 1st or 2nd dentition in other mammals, then we find that in the Kangaroos the incisor teeth all belong to the 1st dentition, that the relations of the canine are uncertain, that the premolars probably belong to the 1st dentition, whereas the molars, or at any rate the 1st, belong to the 2nd dentition.

This last statement is a reversion to older ideas as to the relation of these teeth, held by all odontologists prior to the appearance of Kükenthal's paper, wherein he formulated the theory that the molars belonged to the 1st dentition. As I have already pointed out, he has retracted part of his statements on this point, and I have been unable to confirm his views as to the 1st molar in *Didelphys*, while in the Macropodidæ I have apparently found exactly the reverse condition[2].

I should suggest by way of explanation as to the presence of the permanent molars in a dentition which was otherwise entirely composed of milk-teeth, that owing to the shortness of the jaws the molars were formed very late, and owing to the inability to find room for two sets of what are naturally large teeth, the 1st or milk dentition, as the least important, became suppressed, and is only seen as a slight rudiment attached to the least modified molar,

[1] Similar to the condition seen in the Monitor amongst Reptiles.

[2] For the present I leave out of consideration Leche's (6) account of the condition and homology of the molars of *Erinaceus*, as I have not yet finished my observations on the molars of the Placentalia.

viz. m. 1. One of the most important factors in the modifications which we meet with in the Mammalian dentition is the shortening of the jaws, often accompanied by an enlargement of some of the teeth, thus causing a reduction and finally a suppression of some of the series. These missing teeth can be sometimes discovered through the study of Palæontology, sometimes through the study of Abnormalities, but the surest method when possible is by the study of their development.

The great variability of the anterior premolar of the living Placentalia and the insignificance of our knowledge concerning it, as to which dentition it is to be referred, alone show how futile are our attempts to homologize the dentitions of the leading orders of living Mammalia. And, reflecting upon the facts which I have herein recorded, I believe that our greatest desideratum at present is the further study of the development of the teeth of these animals, especially in its bearing upon the probable discovery and determination of vestigial teeth.

My thanks are due to Prof. Howes for much valuable advice, and to Mr. Fletcher of Sydney, Dr. Symington, and Mr. Oldfield Thomas for gifts of much valuable material.

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V.—EXPLANATION OF PLATES XXXV.–XXXVII.

In all cases the teeth represented are from the left side, and when shown in section are looked at from the front, so that the left of the Plate represents the inner side of the jaw.

Fig. 1. Jaws of *Petrogale* (113 mm. long), clarified, and showing the tooth-germs *in situ*. i^1–i^6, the 6 upper incisors; i_1–i_3, the 3 lower incisors; *c*, canine; pm^3, pm^4, pm_3, pm_4, the upper and lower premolars; m^1, m_1, the 1st upper and lower molar; *pms*, the premaxillo-maxillary suture.

2. Wax model of the enamel-organs of the 1st and 2nd upper incisors; lettering as above. *d.l*, dental lamina; $i^{2'}$, rudiment of successional tooth.

3. Transverse section of the enamel-organs of the 3rd and 4th upper incisors of *Petrogale*.

4. A wax model showing the relation of the 4th upper incisor (i^4) to the 5th (i^5) and 6th (i^6). *Petrogale*.

5. Transverse section through the 5th (i^5) and 6th (i^6) incisors of *Macropus eugenii*. $i^{6'}$, rudimentary successional tooth.

6. Transverse section through the upper 4th and 6th incisors (i^4 and i^6) with the rudimentary successor to the latter ($i^{6'}$). The vestigial 5th incisor (i^5) is dotted in to show its relative position. *M. giganteus*.

7. Transverse section through the developing 1st incisor of *M. giganteus*. $i^{1'}$, successional tooth.

8. Transverse section through the enamel-organ of the 4th incisor and its rudimentary successor, $i^{4'}$. *M. giganteus*.

9. Section taken parallel with the median plane of the head, but transverse to the dental lamina, passing through the 1st and 2nd lower incisors (i_1 and i_2). *Petrogale* (95 cm.).

10. Enlarged drawing of the 1st lower incisor (i_1), showing its advanced calcification and its rudimentary successor i_1'. *Petrogale* (11 cm.).

11. Transverse section through the 2nd lower incisor of *M. giganteus*. i_2', rudimentary successor.

12. Section through the dental lamina between the canine and 3rd premolar, showing a slight differentiation, possibly representing one of the missing premolars. *Petrogale*.

13. Ditto. *M. eugenii*.

14. Section in front of the 3rd lower premolar, *M. giganteus*, showing the missing 2nd premolar.

15. Section through the enamel-organ of the 3rd premolar. *Petrogale*.

16. Section showing the earliest indication of the so-called 4th successional premolar (*ppm*). *Petrogale* (9·5 cm.).

16*b*. Section through the same region as 16*a* in an older embryo. 11 cm.

17. Section showing the character of the dental lamina between figs. 15 and 16 or 16 and 18. *Petrogale*.

18. Enamel-organ of the 4th premolar; *p* possibly represents the last trace of a successional tooth. *Petrogale*.

19. A drawing of a wax model showing the relation between pm^3 and pm^4 and the permanent premolar (*ppm*). *Petrogale*.

20. Section through the enamel-organ of the 3rd premolar of *M. giganteus*.

21. The dental lamina between pm^3 and pm^4, already slightly swollen, the earliest appearance of the successional tooth (*ppm*). *M. giganteus*.

22. The enamel-organ of the 4th premolar. *M. giganteus*.

23. Section through the 3rd premolar and the germ of the so-called 4th successional tooth (*ppm*). *M. eugenii*.

24. Ditto, ditto. *Æpyprymnus rufescens*. Showing the relation of the hitherto supposed successor (*ppm*) to the 4th premolar to pm_3 and pm_4.

25. *a*, *b*. The developing germs of $\frac{m^1}{m_1}$ of *Petrogale*. $\frac{m^1}{m_1}$, the milk-rudiments; $\frac{m^{1'}}{m_1'}$, the germs of the functional and permanent teeth.

Fig. 26. The germ of the 1st upper molar of *M. giganteus*. $m^{1'}$, germ of 2nd dentition; m^1, rudiment of 1st.

27. Premolars, canine, and abnormal incisors of *Perameles* (i_4 and i_5 fused).

28. Section through the dental lamina of *Perameles* between incisors 4 and 5 of the upper jaw, showing enlargement supposed to represent the true 5th incisor.

29. Palatal aspect of the premaxilla of a young *Petrogale xanthopus*, showing the three adult incisors in relation to the jaw and the vestigial canine. *S*, premaxillo-maxillary suture.

May 16, 1893.

Osbert Salvin, Esq., F.R.S., Vice-President, in the Chair.

The Secretary exhibited on behalf of Mr. Rowland Ward, F.Z.S., a complete skin of Grévy's Zebra (*Equus grevyi*), from a specimen recently shot by Col. Arthur Paget in Somali-land.

The following extracts from a letter, from Professor E. C. Stirling, M.D., C.M.Z.S., to Professor Newton, dated "Adelaide, April 10th, 1893"[1], were read:—

". . . . I am writing now to give you early information of a great 'find' of *Diprotodon* remains which I have recently been exploiting, and the results will clear up the remaining points of doubt about this great beast. Some months ago I received information that large bones were visible in a watercourse in a large dry salt lagoon called Lake Mulligan, situated some 20 or 30 miles to the north of a still larger dry salt lagoon which you will find marked as Lake Frome on any good map of South Australia. The accounts were so favourable that I sent up a good man to inspect and report. His accounts were also favourable, and I induced our Museum people to institute a systematic search—and we sent up four men with a complete outfit under the charge of a man who had some considerable experience of the kind of work. This party has been at work for nearly three months with very gratifying results from the reports I got. According to them there are *hundreds* of skeletons available and accessible, and many of them have already been excavated. Several nearly complete skeletons have been exhumed, and all the bones of the body have been found . . . . It appears that the animal had five well-developed toes, the five terminal phalanges of which are almost equal in size. The carpal and metacarpal bones have also been found, though I am not specially informed whether the digits of the manus are also five in number. This, however, is implied from the enclosed sketch which I am able to send you.

"There is a tail of 9 vertebræ, which in one instance was 1 foot

[1] N.B.—Professor Stirling's telegram to Professor Newton published in 'The Times' of 25th April and 'Nature' of 27th April (vol. xlvii. p. 606) is of later date.

2½ inches long, and I am informed that the marsupial bones have also been found. We have also several distinct impressions of the skin of the fore foot.

"Several skeletons of a large Wombat about the size of a bullock have been also unearthed—probably *Phascolomys gigas*; and by the last advices the discovery has been made of a frail, tenderly-built animal about the size of a sheep, of which the nature is as yet unknown.

"The above account will give you some idea of the extent of this deposit of bones, which I think will undoubtedly prove to be one of the most important of its kind yet made in Australia. I am in hope that we shall be able to continue the search for some two or three months longer, by which time we shall have reaped a very rich harvest.

"I ought to mention that the locality is about 600 miles north of Adelaide, in a very inhospitable country, and 180 miles from the railway. In this season of drought all carting and travelling has to be done by Camels, and the temperature averages 110° F. in the shade, occasionally rising to over 120°. Myriads of flies and frequent sand-storms are other trifling difficulties which have to be undergone by the party.

"So far my engagements have not permitted me to get to the spot; but I hope to do so shortly. In any case it will be some time before we can get the bones down to town, as Camels are the only means of communication. When we do get the material to work upon we ought to have something interesting to say, but in the meantime I think you will be glad to have this preliminary report, however fragmentary .... I send you herewith a rough sketch of one of the specimens *in situ* which will better explain some of the points I have mentioned, more especially with regard to the feet. Photographs of others have been taken, but I have not yet received copies; and indeed the impurity and scarcity of the water available has been so far a great hindrance to the development of the plates. The last advices I have received are nearly a month old, owing to the difficulties of access to the place, and I expect a good deal has been done since then.

"In writing to Sir W. Flower some weeks ago I was only able to mention that we had dropped into what seemed to be a good 'find,' but I was unable to give him any details. Perhaps, if you see him you will let him know how we are getting on.

"... This is a very hurried letter, but I only received to-day my last advices about the *Diprotodon*, and the mail which I wish to catch goes to-morrow. Pray, therefore, excuse my imperfect sketch, which I only send as it is because I know you will be interested, and because I should like you to be the first to receive the information such as it is.

"*Addendum*. Professor Tate informs me that the geological formation of this salt-lake district of South Central Australia must be considered Pliocene. Lake Mulligan is, like Lake Eyre, Lake Frome, and other neighbouring lakes marked in the map, a vast

level expanse of salt-encrusted, black mud, only becoming filled after very heavy rains, which are not of very frequent occurrence. Lake Mulligan is relatively small, being only about 8 miles across, and the *Diprotodon* remains are somewhere about midway between the east and west edges. Usually the salt crust is not firm enough for bullock-traffic, and I may safely say that thousands of bullocks have at different times been bogged in crossing or attempting to cross .... The bones, as will be seen, lie close to the surface, that is two or three feet [beneath] .... It would appear that an immense herd of these and other animals had got bogged, probably in seeking water in a dry season, just as cattle do now in the North by hundreds. There is every indication that all this region of South Central Australia was formerly occupied by freshwater lakes. We have, for instance, remains of Alligators or Crocodiles from a district not far off, and other evidence of freshwater-life. Of course we are on the look-out for *Thylacoleo*; but, so far, it does not appear to have been met with; but I am quite hopeful that if we can manage to prosecute the search, that this and perhaps other remains will be met with.

"This is about all the information I can give you at present. Again excuse its unsystematic and fragmentary character, but I am writing far into the night so as to catch the mail to-morrow.

"E. C. S."

The following papers were read :—

1. On the Atrium and Prostate in the Oligochæta. By Frank E. Beddard, M.A., F.R.S., Prosector to the Society.

[Received May 2, 1893.]

The structures termed "atrium" and "prostate" in the Oligochæta have given rise to considerable differences of opinion as to their nature.

The word "atrium" has been generally used for the dilated chamber into which the sperm-duct opens in the Tubificidæ and Lumbriculidæ; "prostate" has been the term usually applied to the glandular structures in Earthworms which are appended to the male duct. The latter term was first applied by Vaillant (1, who first described a worm with the glands in question, viz. *Perichæta posthuma*), who remarked concerning the gland: "faut il y voir une vésicule séminale accessoire ou une glande annexe comparable à une prostate?" The word "atrium" appears to have been first used by Claparède (2, p. 21) in the case of *Tubifex*. Vaillant was of opinion that the glands, which he described for the first time, in *Perichæta* were *sui generis* and not comparable to any structures in other Oligochæta. Vejdovsky is the first writer who has attempted any comparison between the structures in question

throughout the Oligochæta (3, p. 143). The following is a brief epitome of what he has said upon the subject: he considers that the glands described by Perrier in *Perichæta*, *Acanthodrilus*, and *Digaster* are possibly the equivalents of what he (Vejdovsky) terms the "Cement-Drüse" in the Tubificidæ; that the glandular tube in *Eudrilus* which Perrier called "vesicula seminalis" is to be looked upon as the homologue of the atrium in the aquatic Oligochæta; so also is the gland in *Pontodrilus*.

The next contribution to the subject is by myself; I pointed out (4) that the genus *Moniligaster*—an earthworm according to the definition of most naturalists—has a terminal gland connected with the sperm-ducts which agrees in all essentials with the atrium of the aquatic genera. In a further contribution (5) I dealt with the prostates of Earthworms in general, giving reasons for regarding them as the homologues of the atria of the lower Oligochæta.

Among Earthworms there are two principal forms of "prostate" met with. In *Acanthodrilus*, *Pontodrilus*, and other genera the glands are represented by long tubular bodies; in *Perichæta* &c. there are a pair of lobulate bodies often occupying the same position with regard to the ends of the sperm-ducts. One question to be decided was whether these two kinds of glands were related to each other; the next question was whether these glands were homologous with any structure in the lower Oligochæta. As to the first question, the tubular gland of *Acanthodrilus* was shown to differ only from the branched gland of *Perichæta* by the fact that the glandular cells of which it is largely composed are in the latter segregated into masses instead of forming a continuous coating. The answer to the second question is rendered easier by a consideration of the structure of the gland appended to the sperm-duct in *Eudrilus*. Perrier's account of the structure and relations of this gland were not, as I myself showed (6), quite accurate; the sperm-ducts open into the interior of the gland at about its middle. In this feature the gland of *Eudrilus* differs from that of *Acanthodrilus*, which is quite independent of the sperm-duct, or from that of *Pontodrilus*, where the sperm-duct only opens into the gland near to its external aperture. The identity of minute structure, however, appears to favour a comparison of the glands in *Eudrilus* and *Pontodrilus*; the only difference concerns the thick muscular coat of the gland in *Eudrilus*; but I pointed out that the genus *Trigaster* of Benham seems to be an intermediate form in this respect. "The identity of structure," I remarked, "between the glandular bodies appended to the termination of the vas deferens in *Eudrilus*, *Typhœus*, &c., leads to the inference that they are homologous; while the relations of the vas deferens to this body in *Eudrilus* clearly favours the supposition that it corresponds to the atrium in the 'Limicolæ.'" The comparison of the gland of *Perichæta* to the prostates of the Tubificidæ seemed to me to be rendered impossible by reason of the fact that in the former the cells which it was sought to compare were covered by the peritoneum, while in the Limicolæ (I did not particularly mention *Tubifex*) and in the

genus *Moniligaster* "the prostates are formed by a metamorphosis of certain peritoneal cells." The real equivalent therefore of the "prostates" in the Limicolæ and in *Moniligaster* are to be found in the peritoneum of *Acanthodrilus*, *Perichæta*, &c. "In Earthworms therefore," I concluded, "there are two organs which have been termed prostates—(1) the atrium of *Acanthodrilus*, *Perichæta*, &c.; (2) the atrium + prostate of *Moniligaster*."

These opinions were upheld with slight modifications in a subsequent paper (**5**, p. 117 &c.). One important difference between the atria of the higher and those of the lower Oligochæta I sought to explain by the primitive position of the atrial pores. Assuming that they originally were developed as invaginations of the clitellar region, it would follow that the lining membrane would consist, as does the clitellum, of two layers of cells; the resemblance of the cellular lining of the atrium in *Acanthodrilus* &c. to the clitellar epithelium has been commented upon by others as well as by myself. In the lower Oligochæta, on the other hand, the clitellar epithelium is one-layered; hence the lining membrane of the atrium is one-layered also. My later discovery, made since the paper to which I am now referring was written, that *Moniligaster* has a clitellum like that of the lower Oligochæta, still further confirms this way of looking at the facts. In the lower Oligochæta the atrial epithelium is ciliated—another difference as I then thought it; I have, however, lately found that in *Eudriloides brunneus* (n. sp.) the same ciliation at any rate partially occurs. I need not therefore recapitulate my attempt to explain what is now not a difference between the lower and higher genera of Oligochæta. Other points in this paper will be referred to again.

The views expressed in my papers were controverted by Benham (**10**). He points out in the first place a confusion of terms of which I was guilty. Mr. Benham writes:—"Beddard takes up a rather curious position in regard to the prostate of *Moniligaster*. For him the peritoneal coat, outside the muscular wall of the atrium, is the 'prostate' and is homologous with the "Cement-Drüse" (or prostate) of *Tubifex*. Now this prostate in *Tubifex* has been shown by Vejdovsky to be formed by a proliferation and outgrowth of the atrial epithelium at a certain point, which bursts through the muscular wall of the atrium and projects into the body-cavity. The atrial epithelium is derived from the epidermis, so that the 'Cement-Drüse' is epiblastic; whereas the glandular covering of the 'atrium' of *Moniligaster*, *Stylaria*, *Rhynchelmis*, &c. is mesoblastic,—it is in reality a modification of the peritoneal cells. Hence Beddard would regard the epiblastic 'prostate' (Cement-Drüse) of *Tubifex* as the homologue of the mesoblastic covering of the atrium in *Moniligaster*!" I did make this comparison at first; and it seemed to me to be justified by the curious fact that in *Tubifex* the Cement-Drüse was not covered by peritoneum, the rest of the atrium being covered; the disappearance of the peritoneum at this particular point appeared to me to indicate that possibly the data of Vejdovsky were not perfectly accurate.

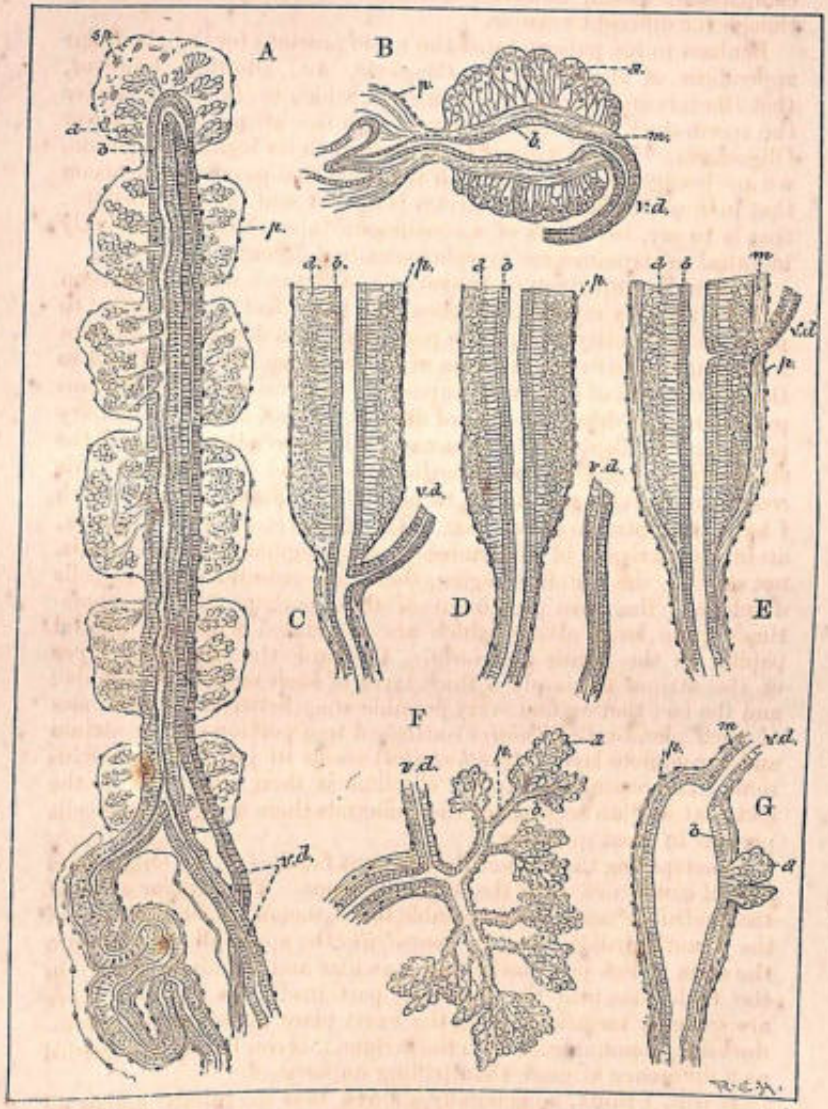
In my fuller paper upon the subject I did not insist upon this comparison, which, however, I shall here again bring forward, though for different reasons.

Benham in his paper retains the name prostate for the glandular appendices of *Acanthodrilus*, *Perichæta*, &c., allowing, however, that the terminal part of these glands, which in *Perichæta* receive the sperm-duct, may be compared with the atrium of the lower Oligochæta. If this view is to be pushed to its logical conclusion, we are brought face to face with the somewhat puzzling conclusion that in *Eudrilus* half of the atrium is atrium and the rest prostate; that is to say, two parts of a continuous tube which are perfectly identical in structure are morphologically different.

A careful comparison of the various structures which have been called atrium by myself throughout the Oligochæta seems to me to prove their identity beyond the possibility of a doubt; an attempt to distinguish between the atria of different families would lead to the enunciation of somewhat impossible conclusions. Before comparing in some detail the atria of different forms, a few preliminary points may be disposed of. I have urged, as already mentioned, the similarity in structure between the atrium and the clitellum; this resemblance seems now to me to be without the significance which I have attempted to attach to it. The atrium is, as far as we know, an involuted region of epidermis; in many regions of the epidermis, not only in the clitellar region, there are unicellular gland-cells developed; the most prominent of these perhaps are the sometimes quite large glands which are associated with the genital papillæ in the genus *Perichæta*. I regard the glandular layer of the atrium as simply a thick layer of such unicellular glands; and the fact that we find every possible stage between a single mass of such gland-cells (*Tubifex*) attached to a portion of the atrium and a complete layer (*Acanthodrilus*) seems to justify this conclusion. The resemblance to the clitellum is then simply due to the fact that in both sections of the epidermis there are glandular cells present in great quantity.

In comparing the atria of the different families of the Oligochæta I shall commence with the higher groups. The tubular atria of the Eudrilidæ must be comparable to the somewhat similar atria of the Acanthodrilidæ &c. In *Pontodrilus* the sperm-ducts open into the atria at the junction of the muscular and glandular parts; in the Eudrilidæ into the glandular part itself. As, however, there are so many variations as to the exact place at which the sperm-duct does communicate with the atrium, this can hardly be regarded as a difference of more than trifling importance.

It will, I think, be generally allowed that the tubular glands of *Acanthodrilus*, *Pontodrilus*, &c., are homologous with the complicated lobate glands of *Perichæta*, *Cryptodrilus* &c. On *a priori* grounds only it seems impossible to distinguish glands which occur in such nearly related forms as *Cryptodrilus* and *Megascolides*. Perhaps if we had only to deal with *Acanthodrilus* and *Perichæta* the *a priori* grounds would not be so strong. Fortunately, how-



Spermiducal glands of various Oligochæta.

A. *Sutroa.* B. *Moniligaster.* C. *Pontodrilus.* D. *Acanthodrilus.* E. *Eudrilus.* F. *Perichæta.* G. *Tubifex.*

v.d, Sperm-duct; *p*, peritoneum; *m*, muscular layer; *a*, glandular layer; *b*, lining epithelium; *sp*, spermatozoa.

ever, there are stronger arguments than those to be derived from considerations of this kind. I have pointed out that in *Megascolex newcombei* the atria have the compact appearance of the corresponding organs of *Acanthodrilus*, to which also they show some slight approximation in outward form; this is further shown in the slight branching of the lumen of the gland. A better instance still has lately come under my observation. In the remarkable genus *Diplocardia*[1] of Garman (**11**) the atria appear on a dissection to resemble those of other Acanthodrilidæ; they are long tubular structures terminating in a short muscular duct. They have, however, a curious spotty appearance, small white rounded masses being imbedded in a darker ground-substance. They are also not quite so regularly tubular as they are in all other Acanthodrilidæ which I have dissected; towards the junction with the muscular duct the tubes are wider, and everywhere the margin is slightly crenate. In transverse sections the reason for these divergences from the normal Acanthodrilid structure was apparent: the white spots are aggregations of the pear-shaped glandular cells, which no longer form a regular investment of the lining epithelium of the tube; and here and there the lumen has inconspicuous diverticula into which the pear-shaped cells pour their secretion. The whole gland in fact shows a commencement of that branching which is so characteristic a feature of the atrium in the Perichætidæ. A little more development of the tendency to the aggregation of the pear-shaped cells and we should have an atrium exactly like that of the Perichætidæ.

If it be reasonable on *a priori* grounds alone to regard the glandular appendices of the sperm-ducts in the Megascolicidæ as homologous throughout, it is at least equally reasonable to seek for detailed resemblances in the atria in the different genera which make up the family of the Tubificidæ. At first sight there seem to be considerable differences. In *Tubifex* itself, and *Limnodrilus* and some other genera identical with *Tubifex* in these particulars, the atrium is long and has the well-known "Cement-Drüse" attached to it; this gland is limited in extent, though varying somewhat in different genera, and is superadded to the lining epithelium of the atrium; Vejdovsky (**3**) has shown that it is developed from the lining epithelium. In *Telmatodrilus* (**12**) there is a series of these outgrowths of the atrial epithelium, which deck the entire atrium, being symmetrically arranged. Finally, in my genus *Branchiura* (**7**) the atrium is closely invested by a thick layer of pear-shaped cells, which are separated from the lining epithelium by a muscular coat of circular fibres. *Ilyodrilus* appears to possess an atrium of the same kind but *minus* the muscular fibres. In *Tubifex* the muscular coat exists but it is less developed than in *Branchiura*; it is, moreover, deficient at the point where the "Cement-Drüse" is grafted on to the atrium. The only remaining genus of Tubificid which shows any differences from these

[1] I am indebted to the kindness of Dr. Benham for the opportunity of examining this worm.

types is *Bothrioneuron* (13), where the "Cement-Drüse" is attached to the summit of a short diverticulum of the atrium.

It seems to me impossible to resist the conviction that *we have here a series of stages in the production of a limited "Cement-Drüse" out of a continuous glandular investment of the atrium.* In *Moniligaster*, whose atrium as regards the points under discussion is so like that of *Branchiura*, the glandular cells which invest it externally perforate the muscular layer to reach the inner epithelium; I imagine that this will be found to be the case with *Branchiura* too. A reduction of this investing layer to a restricted region of the atrium brings about the Cement-Drüse of *Tubifex*; a greater separation between the masses of glandular cells would produce the state of affairs characteristic of *Telmatodrilus*. It is noticeable that the absence of peritoneum upon the atrium of *Branchiura* is seen in *Tubifex* in the region of the Cement-Drüse; why this should be I cannot suggest; but that it is so is a further reason for the justice of my comparisons.

In the family Lumbriculidæ there are indications of a similar series of stages in the conversion of a complete glandular covering of the atrium into a more partial one; but the stages are fewer than in the Tubificidæ, in fact there are only, so far as our present knowledge of the group goes, two such stages. The more usual condition is seen in the majority; in *Rhynchelmis*, for example, the atrium is lined by a layer of cells, outside which are masses of pear-shaped cells which are aggregated to some extent into separate masses; the after all rather slight indications of discontinuity between the masses of cells which clothe the atrium in *Rhynchelmis* are still further emphasized in *Sutroa*. In this Annelid (8) the atrium is invested by very distinctly separate masses of glandular pear-shaped cells; the entire atrium is covered by a thin muscular layer which might be regarded as the peritoneal investment; between this supposed peritoneum and the glandular coat of the atrium lie masses of developing sperm; the structure therefore, whatever be its morphological nature, is, in function, a sperm-sac.

It seems to me that the two families Tubificidæ and Lumbriculidæ are nearly allied, in any case no one has disputed the morphological identity of the organs termed atria in both; it is therefore reasonable, at least pending further information, to assume that the atria correspond in detail, and in this case the Lumbriculidæ, like the Tubificid genus *Branchiura*, have an atrium which is frequently devoid of peritoneum. The intermediate condition between the atrium in the Lumbriculidæ and that in the higher Oligochæta is afforded by the Moniligastridæ. *Moniligaster* itself has an atrium which seems to be identical in all essentials with that of *Branchiura* and the Lumbriculidæ; it has two layers of cells which are separated by a well-developed muscular layer. I have shown (9) that the outer layer of cells sends processes through the muscular layer, which therefore are in a position to void their contents into the lumen of the atrium. I myself have only seen this arrangement

in one specimen of a species recently described by me (9) as *Moniligaster bahamensis*; in the other species investigated there was no trace of any perforation of the muscular layer by the outer layer of cells of the atrium: I imagine, however, that these prolongations of the cells were originally overlooked, owing to their inconspicuous character; they were especially obvious in the species *Moniligaster bahamensis* on account of the ducts being filled with granules of secretion, which were deeply stained by borax carmine. I compared this atrium with that of the Lumbriculidæ and various other aquatic Oligochæta, considering that the outer glandular layer of cells in both was the modified peritoneum. Benham, in the paper to which I have referred, agreed with me in this matter, but held that the cells, from the very fact that they were peritoneal, could not exert a glandular function; he doubted whether there was any known case of "cœlomic epithelium being converted into a gland which pours its secretion to the exterior." This doubt appears to me to be quite justified, but then there is the undoubted fact that the processes of the cells in question *do* pour their secretion on to the exterior through the lumen of the atrium. The explanation of the difficulty seems to be that I was wrong in regarding this glandular epithelium as mesoblastic at all; I have never seen it myself, but Mr. Benham has shown me sections through the atrium of *Moniligaster* in which there was a distinct, though thin layer of peritoneum *outside* the glandular cells. The presence of this does not, however, invalidate my comparisons, though it puts them in a different light, for Benham remarked *apropos* of *Rhynchelmis* that he could "detect in sections a delicate membrane surrounding the pear-shaped cells which is no doubt the true cœlomic epithelium."

The structure of the atrium in *Moniligaster* has also been studied by Rosa, who is disinclined to favour any "limicoline" affinities in that genus; he principally uses the characters of a new Moniligastrid, *Desmogaster* (14), to strengthen his position. In *Desmogaster* the atria have the following structure:—They are tubular glands slightly coiled in an S-shape; the lumen is much restricted, and is floored by a layer of cylindrical cells; outside this, the walls of the atrium are mainly muscular, the fibres being disposed centrally in a circular direction and longitudinally outside: among the external bundles of fibres are groups of gland-cells which by means of long ducts (formed merely by a prolongation of their own substance) reach the lumen of the atrium; but these groups of cells are not exposed at the surface of the atrium on account of the longitudinal muscular fibres; the entire organ is covered externally by a delicate layer of peritoneum. As Rosa points out, this seems to indicate a gradual moving outwards of the pear-shaped cells from their primitive position as lining the lumen of the atrium. My own criticism of this paper (as concerns the facts about the atria), published three years ago, need not here be referred to, as the data upon which it rested are not sufficient. I am now quite of opinion that Rosa was perfectly right in looking upon the

atria of *Desmogaster* as offering an intermediate stage between *Moniligaster* and the higher Oligochæta. In the Oligochæta we have an atrium consisting of two layers of epithelium, covered either by a simple thin peritoneum only, or (in the Eudrilidæ) consisting of thick muscular layers themselves covered with the peritoneal epithelium. In a few simplified genera of Megascolicidæ the lining of the atrium is reduced to the inner layer of epithelium only: these are *Ocnerodrilus*, *Gordiodrilus*, *Pygmæodrilus*, and *Kerria* (an Acanthodrilid). It is, I imagine, fairly probable that these forms are really, so far as concerns the atrium, degenerate in character; they show no real resemblance to the "Limicolæ" as I was at first inclined to believe; for as I now show that the same constituents are present in the atrium of the lower as of the higher Oligochæta, the single layer of cells is a difference from both.

At one time the family Geoscolicidæ was defined by having no atria like other families such as the Megascolicidæ; many genera, however, do possess organs connected with the external pores of the sperm-ducts which seem to be referable to this category. Rosa, however, in an account of the minute anatomy of these organs in *Kynotus* (**15**), is disposed to regard them as morphologically different from the atria of the Megascolicidæ. Unfortunately the description of the structure of the organs in question in *Kynotus* is unaccompanied by any illustrations, so that it is a little difficult to follow. The terminal male apparatus consists of a muscular bulb ("bursa propulsatoria") attached to the walls of the segment, on to which it opens by a retractor muscle; from this muscular sac arises a glandular tube of some length; the muscular sac is divided into two chambers by a transverse septum; from the dorsal one of these is given off the glandular appendix; the appendix is at first lined by a single layer of cells, and it is into this part of it that the sperm-duct opens; further back the lining epithelium is composed of two layers, the outer one being a mass of pyriform glandular cells. Rosa is of opinion that this structure is not the homologue of the atria of the Megascolicidæ; its resemblances, he thinks, are superficial and, such as they are, are due to convergence. The main reasons which Rosa gives for this opinion are three:—(1) The fact that these "pseudoprostates" are found only in a much specialized group of the Geoscolicidæ; (2) their difference in structure from the true "prostates" of the Megascolicidæ; (3) the great resemblance which they show to the sacs accompanying the copulatory setæ of the same worms. The second reason is further expanded into the actual points of difference; these are the following:—the presence of a retractor, the complicated structure of the terminal sac, the mode of connection of the sperm-ducts with the glandular appendix, and the disposition of the glandular part.

It appears to me that the differences are not so great as Rosa would have us believe; it is true that if we compare, as he suggests, *Pontodrilus* with *Kynotus*, the differences are more striking than the resemblances. I, however, decline to regard the

genera *Pontodrilus*, *Microscolex*, &c. as the lowest forms of the Cryptodrilidæ except in the sense that they are degenerate forms; it seems to me that it is the Eudrilidæ which present, as regards the atria, the most obvious likeness to the Geoscolicidæ. In them, as in the Geoscolicidæ, the atrium opens into a terminal "bulbus" which may even, as in *Eudrilus*, possess a pad developed out of its lining epithelium apparently not unlike the "scudo ovale" described by Rosa; the glandular appendix which in the Eudrilidæ opens into this is sometimes (as in *Heliodrilus*) hardly differentiated, as it is in many others, into a muscular and a glandular portion. In Eudrilids the position of the pore of the sperm-duct into the "appendix" is so variable that there is no difficulty in comparing the two families in respect of the fact that in both the sperm-duct opens into the glandular appendix. Even among the other subfamilies of the Megascolicidæ (I am here following Rosa's classification) there are not wanting indications of a close approximation between the atria and those of these Geoscolicids: in some species of the genus *Perichæta*, for example, the atria open into a sac variable in size, which itself opens on to the exterior; it appears to me that this sac is the equivalent of the terminal sac in the Geoscolicidæ. As to the presence of a retractor, which Rosa thinks distinguishes the atrium of the Geoscolicidæ, many Megascolicidæ have bands of muscles which appear to me to be perfectly comparable; for instance, in my genus *Octochætus* (9) among the Acanthodrilids there are bands of muscles which, though perhaps not exactly inserted on to the atria, are attached to the body-wall in their immediate neighbourhood. A better example still is furnished by two species of *Eudriloides* lately examined by me; in these there are a series of muscular strands actually inserted on to the muscular termination of the two atria. To assert that these are in their nature different from those of the Geoscolicids seems to be too strong.

It seems therefore that the facts allow of no other view save that the various structures termed atrium by myself are homologous. The extremes are united by too complete a series of intermediade forms to permit of any doubt upon the point. There are, however, as has been pointed out, differences in detail between the atria of different groups; these amount to so much in the entire series that the complex gland of *Eudrilus*, or *Perichæta*, would perhaps unhesitatingly be regarded as different from the simple atrium of *Stylodrilus*, were there no intermediate stages. Though there would appear to be no great difficulty in deriving the atrium of one family from that of another, it is not so apparent which are the ancestral and which are the derived forms. To determine or attempt to determine this, opens up the whole question of the classification of these Annelids; and in my opinion a consideration of the facts relating to the atria confirms for the most part the scheme of classification adopted by myself. In order to determine which form of atrium is most primitive, it is necessary to enquire into the origin of the atrium.

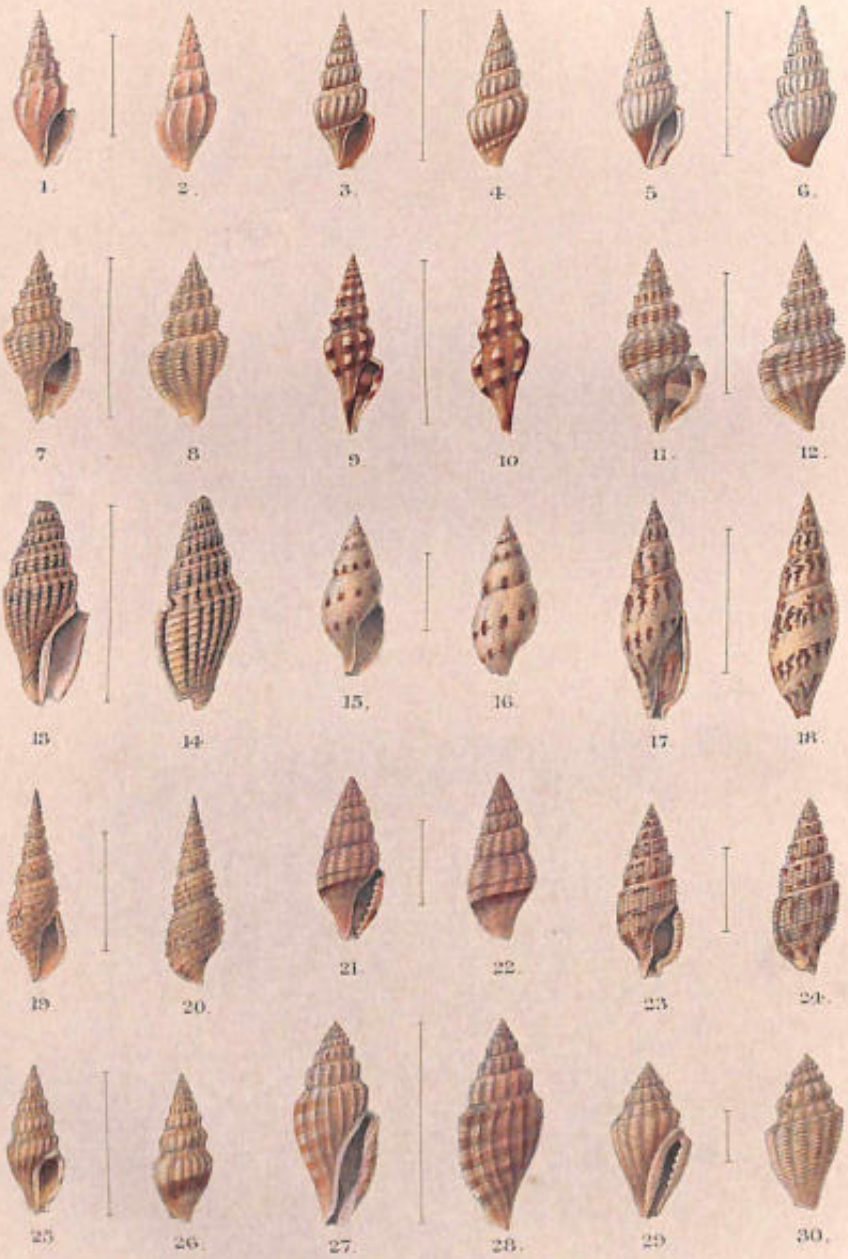
Rosa's view appears to me the most probable; but this, however, he restricts to the Geoscolicidæ. In certain Geoscolicidæ, for example in *Microchæta benhami*, there are a series of paired glands in the neighbourhood of the male pores; in some species, for example in *Kynotus michaelsenii*, setæ are associated with these glands which are in all respects similar to the penial setæ of other Earthworms. His view is that one pair of the glands have become converted into the "pseudoprostates" of other Geoscolicidæ, which I regard, as already pointed out, as identical with the atria of other Oligochæta. These glands are identical in structure with atria, and theoretical considerations also favour their homology. There are many instances among segmented animals of the reduction or concentration of metamerically repeated organs; we are more likely to be correct in assuming in such cases a reduction than a multiplication. It is easy on this assumption to understand the complete independence in the Acanthodrilidæ of the sperm-ducts and the atria; and, furthermore, the remains of additional glands such as occur in *Dichogaster damonis*; in this worm there are three pairs of tubular glands of which one only is connected with the sperm-duct. It is even possible that the glands (which I have called "capsulogenous") of the Perichætidæ are referable to the same category; and it may be pointed out that the papillæ upon which they open are sometimes regularly paired and correspond more or less accurately in position to the male pores. On this hypothesis of the original development of the atria out of copulatory glands, it is clear that those of the higher Oligochæta are nearer to the primitive form of these glands than the lower; and, furthermore, that the retention of more than one pair and their independence of the sperm-ducts are so far primitive characters. The Acanthodrilidæ come obviously very near to the base of the series, though a little further off then certain of the Geoscolicidæ. The Perichætidæ and the Cryptodrilidæ can readily be derived from the Acanthodrilidæ, and it must be remembered that some of the former have tubular atria and may therefore be nearer to the ground form. I do not propose in fact to discuss the relative positions of the different families, as I should have to take other characters into consideration with which this paper does not deal.

The question of terminology has now to be considered; it evidently stands in need of revision. Are we to retain the terms "atrium" and "prostate," or one or neither? They have been used in so many senses that it will lead to misunderstanding if they are again used without careful definition. The use of the term atrium has the objections that Mr. Benham has urged; for in *Acanthodrilus*, for example, the atrium is not a chamber leading into any other chamber or duct; on the other hand, to speak of the "atrium" of *Tubifex* as a "prostate" would give a wrong impression, for the idea of a prostate is a glandular appendix to the male ducts. To speak of the sac itself as an atrium and of the coating of pear-shaped cells as the prostate is disadvantageous; for, excepting in *Tubifex*, the two parts of the terminal apparatus

of the male ducts are combined into one structure. And in *Tubifex* their separation is more apparent than real. It is, in fact, far easier to object to current terms than to invent suitable new ones. In considering this question the origin of the so-called atria must be borne in mind; there are, as has been pointed out, strong reasons for believing them to have been produced by a reduction of glandular sacs often furnished with modified setæ found in the neighbourhood of the male pores and of the spermatothecæ; primarily, we are to suppose, they have no connection with the male pores; it would, however, be inconvenient to speak of them when limited to a single pair into which the sperm-ducts open as "copulatory glands," for by doing so their specialized condition would be lost sight of; it would be the same thing as calling the sperm-ducts nephridia. The various difficulties will perhaps be obviated if we speak of them in those cases where they have a clear relation to the sperm-ducts as "spermiducal glands." This term has the advantage that it has not been before used in the group and hence has no preconceived meaning attached to it; it is also to a considerable extent actually descriptive of the structures in question.

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Mintern Bros. Chromo.

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2. Descriptions of Fifteen new Species of Shells of the Family *Pleurotomidæ*. By G. B. Sowerby, F.L.S.

[Received April 28, 1893.]

(Plate XXXVIII.)

Pleurotoma walcotæ, n. sp. (Plate XXXVIII. figs. 7, 8.)

Testa turrita, breviuscula, rugosa, pallida, antice zona pallide purpurea cincta; spira turrita, acuta, gradata, sutura inconspicua; anfractus 8, *ubique spiraliter striati, supra medium angulati, infra angulum convexi, longitudinaliter costati* (*costis in anfr. ult. circ.* 12), *spiraliter lirati* (*liris in anfr. penult.* 4); *anfractus ultimus spiram subæquans, infra angulum leviter convexus, basin versus subcontractus, vix rostratus; apertura latiuscula, fauce purpureo-grisea; canali brevissimo, leviter recurvo; columella rectiuscula; labrum acutum, crenulatum, superne sinu profundo latiusculo emarginatum.*

Long. 20, *maj. diam.* 10 *millim.*

Hab. Spencer's Gulf, South Australia.

The shell is of the typical form of the section *Drillia*. The purple-grey zone on the lower part of the body-whorl seems characteristic. The type specimen, belonging to the South Australian Museum, has been kindly lent me for description and figuring by W. T. Bednall, Esq.

Pleurotoma huberti, n. sp. (Plate XXXVIII. figs. 11, 12.)

Testa turrita, acuminata, rugosa, fusca, albo-costata, zona albida cincta; spira elata, acuta; sutura vix impressa; anfractus 10, *convexi, obtusissime angulati, ubique spiraliter striati, longitudinaliter costati* (*costis in anfr. ult. circ.* 12), *infra angulum spiraliter lirati; anfractus ultimus spiram paulo brevior, zona albida cinctus, infra medium contractus, breviter rostratus; apertura latiuscula; canali breviusculo, leviter recurvo; labrum incrassatum, superne angulatum, ad angulum late et subprofunde sinuatum.*

Long. 16, *maj. diam.* 8 *millim.*

Hab. Cape Grenville, N.E. Australia.

Of the typical form of the section *Drillia*, the sinus forming a

broad channel in the wing-like expansion of the lip. The longitudinal ribs are nearly white, between which the brown colouring is partly disposed in transverse linear streaks.

PLEUROTOMA ALBOVARICOSA, n. sp. (Plate XXXVIII. figs. 9, 10.)

Testa elongato-fusiformis, glabra, fusca, albo interruptim strigata; spira elongata, turrita, acutissima; anfractus 8, *convexi, longitudinaliter costati, costis rotundatis, albidis, zona fusca transmeatis; sutura callosa, albida; anfractus ultimus elongatus, costis* 6 *munitus, fusco bifasciatus, infra medium constrictus, spiraliter striatus, longirostratus; apertura elongata; columella fere recta; labrum tenue, superne mediocriter sinuatum, canali longiusculo.*

Long. 22, *maj. diam.* 6 *millim.*

Hab. East Africa? (ex coll. Keen).

A prettily painted shell, with a smooth shining surface. The ribs are whitish, crossed on the upper whorls with one and on the body-whorl with two brown zones; the interstices between the ribs are entirely brown. The suture is covered with a whitish callosity.

It may be doubted whether this species is rightly placed in the section or subgenus *Surcula*, but to judge only from the shell, and to propose a new section for it, would be only to add to the already far too numerous ill-defined subdivisions.

PLEUROTOMA EDITHÆ, n. sp. (Plate XXXVIII. figs. 3, 4.)

Testa subfusiformis, sordide albida, fusco zonata; spira elongata, acuta; anfractus 10, *lævigati, superne leviter concavi, obtuse angulati, infra angulum costati, costis elevatis, obtusis, latiusculis; sutura callosa; anfractus ultimus zona lata fusca cinctus, supra medium obtuse angulatus, supra angulum concavus, infra leviter convexus, basin versus attenuatus, spiraliter obscure liratus; apertura oblonga, fauce fusco-tincta; labrum acutum, superne angulatum, ad angulum late et profunde sinuatum; columella arcuata, supra callosa, canali brevissimo.*

Long. 18, *maj. diam.* 7 *millim.*

Hab. Hong Kong.

A shell of simple character. I place it provisionally, but with some doubt, in the section *Clavus*, which may or may not prove to be clearly separable from *Drillia*.

PLEUROTOMA INCLINATA, n. sp. (Plates XXXVIII. figs. 25, 26.)

Testa subfusiformis, solidiuscula, luteo-albida fusco-strigata et balteata; spira elongata turrita, acuta, leviter inclinata; anfractus 10, *convexiusculi, costis numerosis acutiusculis leviter obliquis muniti, spiraliter minutissime striati; anfractus ultimus spiram vix æquans, superne leviter concavus deinde convexus, prope marginem costa crassa instructus, ad basim attenuatus*

haud rostratus, spiraliter liratus; apertura oblonga, latiuscula; columella callosa; labrum acutum, late et profunde sinuatum.

Long. 20, *maj. diam.* 8 *millim.*

Hab. Mauritius.

This species belongs to the *Clavus* group. It has been placed in various collections as *P. albicostata*, Sowerby, with which I find, however, it has little affinity. It comes rather nearer to *P. obliquata*, Reeve.

PLEUROTOMA KEENI, n. sp. (Plate XXXVIII. figs. 13, 14.)

Testa turrita, solida, pallide fusca, nigro-fusco strigata, albo granulata; spira acuminata (apice?); anfractus obtuse angulati, costis numerosis confertis, longitudinalibus subobliquis biseriatim granulatis muniti; interstitiis nigro-fusco strigatis; anfractus ultimus supra angulum leviter concavus, infra angulum convexiusculus, infra medium leviter attenuatus, haud rostratus; apertura oblonga; columella callosa, alba, polita; labrum fere rectum, supra angulum mediocriter sinuatum.

Long. 24, *maj. diam.* 5 *millim.*

Hab. —— ? (ex coll. Keen).

A species of somewhat remarkable character, apparently belonging to the section *Crassispira*. The ribs are beaded with white granules and bordered with dark brown streaks. The specimen has lost several whorls of the spire.

PLEUROTOMA HUNGERFORDI, n. sp. (Plate XXXVIII. figs. 1, 2.)

Testa anguste turrita, grisea, ad apicem fusca; spira elongata, acuta; anfractus 8, *læves, supra medium leviter concavi, infra costis paucis lævigatis muniti; anfractus ultimus breviusculus, supra medium obtuse angulatus, inferne levissime attenuatus, haud rostratus; apertura oblonga, latiuscula; labrum acutum, sinus profundiusculus, mediocriter latus.*

Long. 12½, *maj. diam.* 4 *millim.*

Hab. Hong Kong.

A very simple shell, without sculpture, and with but few smooth longitudinal ribs. It is hardly possible to say in which section this species should be placed, whether it is a *Drillia* or a modification of *Clavus*.

PLEUROTOMA INFRAFUSCA, n. sp. (Plate XXXVIII. figs. 5, 6.)

Testa acuminata, albida, antice rufo-fusca; spira turrita, acutissima; anfractus 10, *primi* 2–3 *læves, sequentes angulati, supra angulum concavi, infra vix convexi, costis numerosis rotundatis, ad angulum elevatis muniti, maculis minutis fuscis ad angulum picti; anfr. ultimus spiram subæqualiter longus, multo latior, basin versus leviter attenuatus, haud rostratus; apertura latiuscula; labrum acutum, vix sinuatum, canali brevissimo.*

Long. 19, *maj. diam.* 7 *millim.*

Hab. Mauritius ? (ex coll. Sir D. Barclay).

The most striking character of this species is its bright reddish-

brown base. It will probably come into the section *Clavus*. The specimen is now in the collection of General Tripe.

DAPHNELLA FUSCO-PICTA, n. sp. (Plate XXXVIII. figs. 15, 16.)

Testa angusta, fusiformis, albida, nigro-fusco conspicue flammulata; spira elongata, ad apicem acuta; anfractus 9–10, *convexi, undique eximie cancellati; sutura angustissime canaliculata; anfractus ultimus oblongus, spiram leviter superans, vix inflatus, inferne leviter attenuatus, haud rostratus, flammulis longitudinalibus albo bifasciatim interruptis pictus; apertura oblonga, utrinque attenuata; labrum leviter crenulatum, sinu profundiusculo emarginato, canali brevissimo.*

Long. 17, *maj. diam.* 5½; *apertura longa* 7½, *lata* 2 *millim.*

Hab. Hong Kong.

A prettily marked and delicately sculptured shell, minutely cancellated throughout. It somewhat resembles *D. flammea* (Hinds), but differs considerably from that species in sculpture (fine close-set longitudinal striæ crossing the spiral ones). In sculpture it closely resembles *D. diluta* (Gould), which species is very different from it in form. Another allied species is *P. delicata* (Reeve), from which it differs both in form and sculpture.

DAPHNELLA SPENCERÆ, n. sp. (Plate XXXVIII. figs. 17, 18.)

Testa acuminato-fusiformis, albida, fusco maculata; spira acuminata, acuta; anfractus 8, *convexiusculi, supremi longitudinaliter plicati, undique spiraliter striati; maculis fuscis conspicuis ornati; anfractus ultimus spiram superans, leviter inflatus, maculis fuscis regularibus rotundatis biseriatim dispositis pictus; apertura oblonga; labrum arcuatum, acutum, sinu profundiusculo angustiusculo emarginato, canali brevissimo.*

Long. 10, *maj. diam.* 4; *apertura longa* 4, *lata* 2 *millim.*

Hab. Hong Kong.

A beautiful little shell, of which I have only seen a single specimen. It is finely spirally striated throughout, the upper whorls being longitudinally plicated. The colouring consists of conspicuous rounded brown blotches, which upon the body-whorl are disposed in two rows, one above and one below the middle of the whorl.

DAPHNELLA ELATA, n. sp. (Plate XXXVIII. figs. 19, 20.)

Testa turrita, luteo-albida, maculis pallide fuscis promiscue conspersa; spira perelongata, acutissima; anfractus 10, *primi* 2 *fusci læves, sequentes leviter angulati, liris spiralibus numerosis acutis cingulati, longitudinaliter minute interplicati; anfractus ultimus spiram vix æquans, leviter convexus, infra medium constrictus; apertura oblonga, parva; labrum extus crenulatum, sinu breviusculo emarginato, canali brevissimo.*

Long. 15, *maj. diam.* 4; *apertura longa* 5, *lat.* 1½ *millim.*

Hab. Mauritius.

This species has a much longer spire than others of the group;

in sculpture it resembles *D. lactea*, but the spiral ridges are closer; in form it approaches *D. flammea* and *D. subula*.

DEFRANCIA INFRACINCTA, n. sp. (Plate XXXVIII. figs. 21, 22.)

Testa oblonga, solida, carnea; spira mediocriter elata, ad apicem acuta; anfractus 8, *convexi, linea fusca tenuissima ornati, spiraliter lirati, longitudinaliter costati, costis numerosis, rotundatis; anfractus ultimus vix inflatus, infra medium leviter constrictus, fascia fusca conspicua pictus; apertura breviuscula; labrum extus incrassatum, intus serratum, superne profunde sinuatum, canali brevissimo.*

Long. 10, *maj. diam.* 4 *millim.*

Hab. Mauritius.

A rather rough shell, with numerous rounded ribs, crossed by close-set raised ridges. The conspicuous band near the base surmounted by a thin brown line seems characteristic.

DEFRANCIA MAURITIANA, n. sp. (Plate XXXVIII. figs. 23, 24.)

Testa turrita, albida, maculis fuscis promiscuis picta, undique costis numerosis confertis granulatis sculpta; spira elata, leviter convexa, ad apicem acuta; anfractus 9, *gradati, levissime convexi; sutura impressa; anfractus ultimus spiram vix æquans, haud inflatus, rectiusculus, ad basim constrictus; apertura parviuscula, oblonga; labrum crenulatum, incrassatum, superne sinu profundo emarginato, inferne abrupte constrictum, canali brevissimo.*

Long. 10, *maj. diam.* 3 *millim.*

Hab. Mauritius.

A conspicuously painted species, with a strongly granulated surface; the constriction of the base is peculiar.

CYTHARA GUENTHERI, n. sp. (Plate XXXVIII. figs. 27, 28.)

Testa solidiuscula, utrinque acuminata, albida, pallide fusco tincta et vittata, postice purpureo tincta; spira elato-conica, gradata; anfractus 10, *angulati, undique spiraliter striati, longitudinaliter costati; anfractus ultimus spiram superans, convexiusculus, basin versus attenuatus; apertura elongata, angusta; columella levissime curvata, albo-callosa; labrum extus incrassatum, ad marginem acutum.*

Long. 25, *maj. diam.* 11; *apertura longa* 15, *lat.* 3 *millim.*

Hab. Holothuria Banks, N.W. Australia, 38 fathoms.

A beautiful delicately sculptured shell, hitherto without name, in the British Museum Collection.

CYTHARA RINGENS, n. sp. (Plate XXXVIII. figs. 29, 30.)

Testa abbreviata, angulata, utrinque acuminata, alba; spira conica, ad apicem acuta; anfractus 7, *angulati, longitudinaliter costati, spiraliter subtilissime striati; sutura anguste canaliculata; anfractus ultimus spiram superans, angulatus, supra angulum leviter concavus, deinde vix convexus, basin versus*

regulariter attenuatus; costis longitudinalibus circ. 8; *apertura elongata, angusta, columella granulata et plicata; labrum incrassatum, intus serratum, supra angulum leviter sinuatum.*

Long. 7, *maj. diam.* 3 *millim.*

Hab. Hong Kong.

Of the typical form of *Cythara*. The serrated lip and columella present the appearance of two rows of teeth, almost like those of the *Cypreæ*.

EXPLANATION OF PLATE XXXVIII.

Figs. 1, 2. *Pleurotoma hungerfordi*, p. 489.
3, 4. —— *edithæ*, p. 488.
5, 6. —— *infrafusca*, p. 489.
7, 8. —— *walcotæ*, p. 487.
9, 10. —— *albovaricosa*, p. 488.
11, 12. —— *huberti*, p. 487.
13, 14. —— *keeni*, p. 489.
15, 16. *Daphnella fusco-picta*, p. 490.
17, 18. —— *spenceræ*, p. 490.
19, 20. —— *elata*, p. 490.
21, 22. *Defrancia infracincta*, p. 491.
23, 24. —— *mauritiana*, p. 491.
25, 26. *Pleurotoma inclinata*, p. 488.
27, 28. *Cythara guentheri*, p. 491.
29, 30. —— *ringens*, p. 491.

3. A Nominal List of the Mammals inhabiting the Bornean Group of Islands. By A. H. Everett, C.M.Z.S.

[Received May 2, 1893.]

As no complete catalogue of the Mammals of Borneo and Palawan appears to be available for the use of Oriental Zoogeographers, whilst a considerable number of new species have been recorded of recent years, the notices of which are scattered among various scientific serials, it is hoped that the present list, although a merely nominal one, may not be without its use.

I have elsewhere[1] detailed the evidence which seems to render it necessary that Palawan should be treated as forming an integral part zoologically of the Bornean group of islands. The area of the Bornean group as a whole may be defined, therefore, for the purpose of the present list, by the same limits as those which I have adopted in a list of the Birds of Borneo and Palawan[2], viz., by a line which starts from a point immediately to the west of St. Julian I. in the Tambelan Archipelago, and, being drawn south of the Great Natuna (Bungoran I.), passes northward of Labuan and thence follows the 100-fathom line so as to embrace Balabac, Palawan (Paragua), the Calamianes, and the Cuyo Islands, and, returning along the same line of soundings on the southern side of

[1] P. Z. S. 1889, p. 220.
[2] Journ. Straits Branch R. As. Society, xx. p. 92 (1889).

Palawan, is drawn immediately to the eastward of the islands of Cagayan Sulu and Sibutu,—whence it is continued through the Macassar Straits south of the Paternoster, Lauriot (Laset Ketjil), and Solombo islets, and in a north-westerly direction through the Karimata Strait back to the island of St. Julian.

In attempting thus to define the area within which the neighbouring smaller islands may be regarded as being affiliated zoologically to Borneo, there exists no guide in many cases beyond their greater proximity to the latter island than to the other large masses of land by which they are more or less closely environed, supplemented by the evidence (often very imperfect) afforded by the soundings shown on our Admiralty charts. The limits adopted above must therefore be looked upon as being in some degree approximate. Nevertheless, as there are not any islands of considerable size of which the fauna is wholly unknown bordering upon the line of delimitation, it is not probable that material extensions or contractions of the boundary here assumed for the Bornean group as a whole will be necessitated by the result of future field-work.

Turning to the accompanying list, it may be remarked that no family of Mammals is peculiar to the group and that only three genera are so, viz. *Nasalis*, *Trichys*, and *Rhithrosciurus*, which, so far as we know at present, are all confined exclusively to the island of Borneo itself. Peculiar species, however, are fairly numerous, and they are indicated in the list by the prefix of a single or double asterisk in accordance with their being confined to Borneo or to the Palawan Sub-group respectively. Although the general facies of the mammalian fauna of the Sub-group is clearly Bornean, it is to be noted that no species appears to be peculiar to the group as a whole, a fact which suggests the inference that, closely connected as Borneo has undoubtedly been with Balabac and Palawan, and isolated as they have been together from the mainland of Asia, there has also been much isolation of Borneo and Palawan *inter se*.

A few of the species enumerated have been no doubt introduced by man. Such are the Common Mouse and the Black and Brown Rat, with the Buffalo; and it seems probable that the Javan Sambur (*Cervus hippelaphus*) and the Elephant owe their presence to the same agency. A few other species which have been credited to Borneo will be found to have been omitted below. Thus *Hylobates concolor*, Harlan, is almost certainly identical with *H. muelleri*, Martin. *Macacus maurus*, F. Cuv., long believed to inhabit Borneo, has been shown [1], to be restricted to the southern peninsula of Celebes and to the neighbouring island of Bouton. There is a stuffed specimen of *Canis aureus*, Linn., in the Leyden Museum which is labelled as having been collected by Diard in Borneo, but it is more than doubtful whether the locality is correct[2]. The Javan Rhinoceros (*R. sondaicus*) has been supposed to exist in Borneo, but my inquiries on the subject have failed to elicit any reliable evidence

[1] Weber, Zool. Ergebn. Niederl. Ost-Ind., Leiden, 1890, p. 103.
[2] Blanford, Faun. Brit. India, Mammalia, i. p. 141.

that this is the case; but the discovery of some subfossil molars in Sarawak, which have been identified as belonging to this species on good authority [1], render it probable that it may yet be discovered in the comparatively unexplored interior. It is remarkable, in this connexion, how extremely rare the remains of Pleistocene or Quaternary mammals appear to be in Borneo, and this scarcity must be real, taking into account the extensive surface-mining which has long been practised in Western and South-eastern Borneo, and the value which natives set on such objects as fossil teeth for use as charms, medicine, &c.

Notwithstanding the numerous additions made in recent years to the list of the Mammals of Borneo and Palawan by Mr. John Whitehead and of Borneo by Mr. Charles Hose, many species doubtless await discovery, especially among the smaller mammals and the Cetacea, of which latter our knowledge remains at present practically a blank. Among the Chiroptera particularly, it may be expected that a number of species already known in the neighbouring countries will be detected as ranging into some part of the Bornean group, such, for instance, as *Miniopterus schreibersi*, *Kerivoula picta*, *Vespertilio hasselti*, *Vesperugo abramus*, *V. noctula*, *V. pachypus*, *Hipposiderus speoris*, *Xantharpyia amplexicaudata*, &c.

In concluding these brief remarks I wish to express my best thanks to Mr. Oldfield Thomas, of the British Museum, to whose courtesy and assistance I have been frequently indebted both in the identification of species and in various other ways.

PRIMATES.

Fam. Simiidæ.
- Simia satyrus, *Linn.*
- —— morio, *Owen*[2].
- Hylobates leuciscus, *Schreb.*
- *—— muelleri, *Martin.*

Fam. Cercopithecidæ.
- Semnopithecus maurus, *Schreb.*
- *—— chrysomelas, *Müll.*[3]
- *—— cruciger, *Thos.*[3]
- *—— hosei, *Thos.*
- *—— everetti, *Thos.*
- *—— rubicundus, *Müll.*
- *—— frontatus, *Müll.*
- *Nasalis larvatus, *Wurmb.*
- Macacus arctoides, *Geoffr.*[4]
- —— nemestrinus, *Linn.*
- —— cynomolgus, *Linn.*

Fam. Lemuridæ.
- Nycticebus tardigradus, *Linn.*

Fam. Tarsiidæ.
- Tarsius spectrum, *Pallas.*

CHIROPTERA.

Fam. Pteropodidæ.
- Pteropus edulis, *Geoffr.*
- —— hypomelanus, *Temm.*
- *Cynopterus spadiceus, *Thos.*
- —— marginatus, *Geoffr.*
- *—— lucasii, *Dobson.*
- —— ecaudatus, *Temm.*
- *—— maculatus, *Thos.*
- Eonycteris spelæa, *Dobson.*
- Carponycteris minimus, *Geoffr.*

Fam. Rhinolophidæ.
- Rhinolophus luctus, *Temm.*
- —— trifoliatus, *Temm.*
- —— affinis, *Horsf.*
- —— minor, *Horsf.*
- Hipposiderus diadema, *Geoff.*
- —— galerita, *Cantor.*
- —— cervinus, *Gould.*
- *—— doriæ, *Peters.*
- —— bicolor, *Temm.*

Fam. Nycteridæ.
- Megaderma spasma, *Linn.*

[1] Busk, P. Z. S. 1869, p. 409.
[2] Doubfully distinct from *S. satyrus*. Said to occur in Northern Sumatra.
[3] Both doubtfully distinct from *S. femoralis*, Horsf.
[4] Günther, P. Z. S. 1876, p. 425.

Fam. Vespertilionidæ.
*Vesperugo stenopterus, *Dobson*.
—— imbricatus, *Horsf.*
—— tenuis, *Temm.*
*—— tylopus, *Dobson*.
*—— doriæ, *Peters*.
Scotophilus kuhli, *Leach*.
Harpiocephalus suillus, *Temm.*
Vespertilio adversus, *Horsf.*
—— muricola, *Hodgson*.
Kerivoula papillosa, *Temm.*
—— hardwickei, *Horsf.*

Fam. Emballonuridæ.
Emballonura semicaudata, *Peale*.
—— monticola, *Temm.*
Taphozous melanopogon, *Temm.*
—— longimanus, *Hardw.*
—— affinis, *Dobson*.
Chiromeles torquatus, *Horsf.*
Nyctinomus plicatus, *Buch. Ham.*

INSECTIVORA.

Fam. Soricidæ.
Chimarrogale himalayica, *Gray*.
Crocidura fuliginosa, *Blyth*.
*—— fœtida, *Peters*.
*—— doriæ, *Peters*.
Pachyura indica, *Geoffr.*
—— hosei, *Thos.*

Fam. Erinaceidæ.
Gymnura rafflesi, *Vigors*.
Hylomys suillus, *Müll.*

Fam. Tupaiidæ.
Ptilocercus lowi, *Gray*.
Dendrogale murina, *Müll.*
Tupaia javanica, *Horsf.*
*—— minor, *Günth.*
*—— melanura, *Thos.*
—— ferruginea, *Raffles*.
*—— splendidula, *Gray*.
—— tana, *Raffles*.
*—— chrysura, *Günth.*
*—— dorsalis, *Schleg.*
*—— picta, *Thos.*
*—— montana, *Thos.*

Fam. Galeopithecidæ.
Galeopithecus volans, *Linn.*

CARNIVORA.

Fam. Mustelidæ.
Putorius nudipes, *F. Cuv.*
Mustela flavigula, *Bodd.*
Mydaus meliceps, *F. Cuv.*
**—— marchei, *Huet*[1].
Lutra sumatrana, *Gray*.
—— cinerea, *Illiger*.

Fam. Ursidæ.
Ursus malayanus, *Raffles*.

Fam. Canidæ.
? Cyon rutilans, *Müll.*

Fam. Viverridæ.
Herpestes brachyurus, *Gray*.
*—— semitorquatus, *Gray*.
Cynogale bennetti, *Gray*.
Arctictis binturong, *Raffles*.
Hemigale hardwickei, *Gray*.
*—— hosei, *Thos.*
Arctogale leucotis, *Blyth*.
Paradoxurus leucomystax, *Gray*.
—— hermaphroditus, *Pallas*.
—— philippinensis, *Jourdan*.
Linsang gracilis, *Müll.*
Viverra tangalunga, *Gray*.

Fam. Felidæ.
Felis planiceps, *Vig. & Horsf.*
*—— badia, *Gray*.
—— temminckii, *Vig. & Horsf.*
—— bengalensis, *Kerr*.
—— marmorata, *Martin*.
—— nebulosa, *Griffith*.

RODENTIA.

Fam. Hystricidæ.
*Trichys guentheri, *Thos.*
*Hystrix crassispinis, *Günth.*
**—— pumila, *Günth.*
—— muelleri, *Jent.*

Fam. Muridæ.
Mus rattus, *Linn.*
—— decumanus, *Pallas*.
*—— infraluteus, *Thos.*
—— muelleri, *Jent.*
*—— sabanus, *Thos.*
—— hellwaldi, *Jent.*
—— jerdoni, *Blyth*.
*—— alticola, *Thos.*
—— musschenbroecki, *Jent.*
—— ephippium, *Jent.*
—— musculus, *Linn.*
*—— margarettæ, *Thos.*
*Chiropodomys major, *Thos.*
*—— pusillus, *Thos.*

Fam. Sciuridæ.
Sciuropterus pulverulentus, *Günth.*
—— horsfieldi, *Waterh.*
—— sctosus, *Temm.*
—— genibarbis, *Horsf.*
**—— nigripes, *Thos.*
Pteromys nitidus, *Desm.*
*—— phæomelas, *Günth.*
*Rhithrosciurus macrotis, *Gray*.

[1] Huet, Le Naturaliste, 1887, p. 149.

Sciurus bicolor, *Sparrm.*
—— ephippium, *Müll.*
—— prevosti, *Desm.*
—— hippurus, *Geoffr.*
*—— pryeri, *Thos.*
*—— brookei, *Thos.*
—— tenuis, *Horsf.*
*—— lowi, *Thos.*
*—— jentinki, *Thos.*
—— notatus, *Bodd.*
—— insignis, *Desm.*
*—— hosei, *Thos.*
*—— everetti, *Thos.*
**—— steerei, *Günth.*
—— laticaudatus, *Müll.*
—— soricinus, *Müll. & Schl.*
—— exilis, *Müll.*
*—— whiteheadi, *Thos.*

UNGULATA.

Fam. Elephantidæ.
Elephas indicus, *Linn.*

Fam. Rhinocerotidæ.
Rhinoceros sumatrensis, *Cuv.*

Fam. Tapiridæ.
Tapirus indicus, *Cuv.*

Fam. Bovidæ.
Bos sondaicus, *Müll.*
—— buffelus, *Blumenb.*

Fam. Cervidæ.
Cervus equinus, *Cuv.*
—— hippelaphus, *Cuv.*
—— sp. inc.
Cervulus muntjac, *Linn.*

Fam. Tragulidæ.
Tragulus napu, *F. Cuv.*
**—— nigricans, *Thos.*
—— javanicus, *Gmel.*

Fam. Suidæ.
Sus vittatus, *Müll.*
—— verrucosus, *Müll.*
*—— barbatus, *Müll.*
—— longirostris, *Nehring.*
**—— ahænobarbus, *Huet* [1].

CETACEA.

Fam. Delphinidæ.
Delphinus sp. inc.
Orcella brevirostris, *Owen.*

Fam. Balænidæ.
Balænoptera sp. inc.
(*Megaptera*?)

SIRENIA.

Fam. Halicoridæ.
Halicore dugong, *Erxl.*

EDENTATA.

Fam. Manidæ.
Manis javanica, *Desm.*
—— sp. inc. [2]

4. Brief Notes on Flukes. By Prospero Sonsino, M.D., Pisa. (Communicated by Prof. F. Jeffrey Bell.)

[Received May 16, 1893.]

Distomum trigonocephalum, R.

In the collection of Worms in the British Museum (Natural History), which, through the kindness of Dr. Günther and Prof. Jeffrey Bell, I was enabled to examine in 1891 while attending the International Hygienic Congress, my attention was attracted to a bottle containing a worm which was labelled "*Ophistomum mucronatum*, R.," but which, some days previous to my visit, my friend Prof. Blanchard, after a cursory examination, had decided to be a *Distomum*. Prof. Blanchard had not sufficient time to examine the anterior end of the single specimen, which was lying upon the dorsal side of the body, and so he failed to perceive that this

[1] Huet, Le Naturaliste, 1888, p. 5.
[2] Marche, Luçon et Palaouan, 1887, p. 302.

Distome belongs to the subgenus *Echinostomum*, Dujardin, the oral sucker being surrounded by a disk bordered by a circle of spines. Dr. L. Örley, who some years ago published an account of the Nematodes from the collection of Prof. Siebold in the Museum [1], has not mentioned there the supposed *Ophiostomum*, therefore we may fairly infer that he had not examined it.

In the unique specimen of the worm in question, notwithstanding its rather bad condition, the following characters may be verified:—Body flat, elongated, rather narrowed behind; length 7 millim., breadth 2 millim., with the greatest diameter corresponding to the ventral sucker, which is larger than the oral sucker. The latter surrounded by a triangular disk, bordered by spines. The number of these latter appeared to me to be 24, comprising the 4 lateral and inferior larger. A darker spot behind the ventral sucker is due to the oviduct being full of eggs, which are of large size and not less than 100 micromillim. in length. Yolk-glands rather voluminous from the ventral sucker to the posterior end. Two oval testes at the beginning of the posterior half of the body, one behind the other. Ovarium anterior to the testes.

With such characters I suspected that the Trematode was *D. trigonocephalum*, the ordinary *Echinostomum* found in mammals; but before pronouncing myself definitely, I wished to compare the characters of the specimen in question with those of *D. trigonocephalum*. My short visit to the British Museum not allowing me to make this comparison there, I made it when I returned home. I found in the collection of the Zoological Museum of Pisa no less than four bottles containing *D. trigonocephalum* obtained from three different species of Mammals, viz. *Mustela foina*, *M. putorius*, and *Meles europæus*. Thus I had plenty of material to give me a clear notion of the characters and different appearances of *D. trigonocephalum* from various sources. I am now able to say that the specimen of the Trematode of *Plecotus communis* in the collection of the British Museum is, both as regards size and conformation of the body, as well as the disposition of the spines around the oral sucker, much like *D. trigonocephalum*. There is also a similarity in the eggs. Only the testes of the *Echinostomum* in the British Museum appear to be situated rather more behind; but I do not attach much importance to this. Indeed the number of the spines round the head given by von Linstow [2] and verified in many specimens by myself is 26 instead of 24. But it is possible that I mistook the number when examining the specimen. I think, therefore, that the specimen in the British Museum is nothing else but *D. trigonocephalum*. In his 'Compendium,' Linstow does not make mention of such a Trematode as parasitic in any Bat. But *D. trigonocephalum* has been found in *Erinaceus europæus*, and it is rather interesting to know that it may also be parasitic in a Bat. Thus it is found in animals belonging to no

[1] Ann. & Mag. Nat. Hist. ser. 5, vol. ix. p. 301 (1882).
[2] Troschel's Archiv, i. p. 106 (1873).

less than three different orders of Mammals, undoubtedly on account of the food that they may partake of in common.

DISTOMUM OVO-CAUDATUM, Vulpian.

Distomum ovo-caudatum, both of *Rana esculenta* and of *R. temporaria*, has been described since 1859, by Vulpian, as living in the mouths of these animals. Vulpian gave an interesting account of this worm and has not failed to put in evidence the important character of the presence of a basal filament in the egg,—a character very rarely to be seen in the digenetic Trematodes, but frequently observed in monogenetic or ectoparasitic Trematodes. Recently Creutzburg has published an interesting study of the life-history of the same worm, which according to him in its larval form is the famous *Cercaria cystophora*, Wagener, which was once referred by Willemoes-Suhm to *D. lanceolatum*, Mehlis. According to Creutzburg, the intermediary host of *D. ovo-caudatum*, a *Planorbis*, would become infested not by active introduction of the embryo into its body, the embryo being unable to swim in water, but by eating the eggs with the contained embryo, which eggs are found in the fæces of frogs. In a similar way the final host would be infested by eating *C. cystophora* contained in its nurse within the tissues of the mollusk. But as yet Creutzburg has not succeeded in rearing the adult worm in the mouth of a frog, by introducing the tissues of *Planorbis* containing *C. cystophora*.

I am certainly not prepared to criticise Creutzburg's work, which is only preliminary; but I wish to point out some facts observed by myself, which are not in accordance with those noticed either by Creutzburg or Vulpian, respecting the worm in question. I have had good opportunities to observe and study *D. ovo-caudatum*, which I have found rather frequent in both *Rana esculenta* and *R. temporaria* in the neighbourhood of Pisa. I may now draw the following conclusions as to the result of my observations, of which I gave a full account in the 'Monitore Zoologico' of last April:—(1) *D. ovo-caudatum* takes up its abode not only in the mouth, but also in the stomach and the upper part of the intestines. It is perhaps more frequent in the stomach than in the mouth, and it is possible that its occurrence in the mouth is merely accidental, and the result of an emigration, occasioned by the distressed condition of the worm on the death of the host. (2) The basal filament is from 4 to 6 times as long, or even longer, than the length of the body of the egg. If previous observers have given a shorter length, it is probably in consequence of their having seen only a truncated filament, or of not having properly focussed the microscope so as to see the entire length of the filament, which gradually thins towards the end. (3) The embryo is not only armed with a crown of spines (*bâtonnets*) on its anterior extremity, but evidently possesses even cilia. Whether these cilia aid it to swim in water when it issues from the egg, spontaneously and completely mature, or are simply for locomotion in the intestines of *Planorbis*, I am not prepared to say, not having seen the

embryo alive and swimming in water, but only the embryo coming out from the shell by pressure. In this case the embryo has always died and has often presented the body spoiled and without the ciliar tegument, so that I was only once able to observe a specimen with the cilia in motion.

FLUKES OF EXOTIC SNAKES.

In a bottle in the collection of parasitic worms in the Museum of Pisa I found, in 1890, a *Distomum* obtained from the renal pelvis of *Python molurus*. I described it under the name of *Distomum simile*[1], regarding it as a new species, resembling in size and structure *D. lanceolatum*, with the exception that the two testes, instead of being anterior to the ovary, were situated behind that organ. Other examples of a similar Distome, obtained from the liver of an animal of the same species, I thought, but could not be certain, owing to decomposition of the specimens, might also be *Distomum simile*. At the time I could not compare *Distomum simile* with the *Distomum horridum* of Leidy, because I had not access to Leidy's description. But lately, through the kindness of Dr. Stiles, I have received a specimen of Leidy's *Distomum horridum* (obtained from a Boa Constrictor), and from this I have been able to satisfy myself of the identity of *D. simile* and *D. horridum*. I have since read Leidy's paper[2] describing the parasite, and although in some respects his description is somewhat incorrect, as he speaks of four testes instead of two, and of vitellaria as ovaria, I can recognize in it the identity of *Distomum simile* with *Distomum horridum*.

Another species which appears very similar to *D. horridum* is the *D. sauromatis*, described as new by M. J. Poirier. The principal difference between *D. simile* and *D. horridum* on the one hand, and *D. sauromatis* on the other, is that in the latter the two testes are lobate instead of being round as in the former. This variation is so slight that it may merely depend on the diverse habitats of the individuals and not on difference of species. I cannot, however, definitely pronounce on this point, not having at hand a specimen of Poirier's *Distomum*, which lives in the lungs of *Elaphis sauromates*. But the identity of *Distomum simile* with *D. horridum* is very interesting, as it shows that the same species of *Distomum* lives in two different species of Snakes inhabiting different countries.

DISTOMUM BARALDII.

Distomum baraldii is a parasite which I have lately described as a new species found in *Zamenis viridiflavus*[3], and which I have

[1] See 'Processi verbali della Società Toscana di scienze naturali residente in Pisa,' Adun, 4 Maggio, 1890.

[2] Journal Acad. Natur. Sciences, series 2, i. p. 303 (Philadelphia).

[3] *D. baraldii*, given by me as a new species, may prove to be identical with *Distomum nigrovenosum*, Bellingham, found in *Tropidonotus natrix*. At least my new species much resembles the description and figure given by my friend Dr. Monticelli of Bellingham's fluke in an unpublished paper with which I have made acquaintance by the author's kindness.

often obtained in Pisa from the mouth and gullet of the Snake referred to. The colour of this small Distome is quite characteristic, being white in the anterior and black in the posterior half. But the most interesting point in connection with this Distome is that I often found in *Zamenis viridiflavus* an imperfectly developed Distome encysted in the submucosa of the mouth, in the pericardium, and in the mesenterium; and as I obtained the cysts sometimes empty, sometimes full, and as the full cysts when placed in water rupture quickly and allow the young Distome to escape, and there is some resemblance between this young Distome and *D. baraldii*, I suspect that the encysted and the mature Distomes belong to the same species, and that, contrary to the usual course in the evolution of the Distomes, the same animal plays the part both of intermediary and final host to this parasite.

5. On a Second Collection of Mammals sent by Mr. H. H. Johnston, C.B., from Nyasaland. By Oldfield Thomas.

[Received May 16, 1893.]

In the 'Proceedings' of this Society for last year[1] I had the honour of giving an account of a fine collection of Mammals presented to the National Museum by Mr. H. H. Johnston, Consul-General for Mozambique, and H.M. Commissioner for Nyasaland. That distinguished explorer has now sent home a second series, collected, like the first, by Mr. Alexander Whyte, at Zomba and Milanji. Of these, by the kindness of our Secretary, I am now permitted to give a list, supplementary to the former one, and carrying on a little further our knowledge of the Nyasaland fauna, to the study of which Mr. Johnston and Mr. Whyte have rendered such material aid.

The present collection contains between 70 and 80 specimens, belonging to 30 species, of which a large number are additional to those previously sent. As with the previous set, the great interest of the collection lies in its having been made so near to the localities where Dr. Peters obtained the material on which his classical work on the Mammals of Mozambique was founded. Such a collection as this, therefore, although containing no novelties, is, and will always continue to be, of the greatest service to English naturalists, as giving them the means of accurately comparing specimens from other parts of Africa with examples certainly corresponding with those described by Peters.

With regard to the interesting questions as to the seasonal changes of fur, which so sorely need investigation, it unfortunately happens that the present collection was almost entirely formed in the months of October and November, the very same months when the previous series were obtained. It would therefore be very desirable for Mr. Whyte to try and collect specimens of all the

[1] P. Z. S. 1892, p. 546.

species now and previously sent at other times of the year. Seasonal variation has been but little studied in African mammals, and specimens obtained by so able a collector all from the same place and at different seasons would have the utmost value as enabling us to form a comprehensive idea as to the general influence that the changes of such a climate as that of Nyasaland have on its Mammalian inhabitants.

Pending the formation of such a supplementary collection, the present series, full as it is of rarities from a Museum point of view, demands for publication little more than a nominal list of the species sent.

1. Otogale kirkii, Gray.

a. Ad. sk. Nmasi. 9/92.

This skin is not in a good state, and the fur appears to be in process of change. There seems, however, to be little doubt that it represents *O. kirkii*, whether that does or does not prove in the end to be a valid species.

2. Petrodromus tetradactylus, Pet.

a. Ad. al. ♀. Milanji. 10/92.

3. Crocidura sp. inc.

a. Ad. al. Milanji. 10/92.

4. Crocidura sp. inc.

a. Ad. al. Milanji. 10/92.

5. Herpestes gracilis, Rüpp.

a, *b*. 2 ad. sks. Zomba. 11/92.

These specimens evidently belong to the S.-African type of the species, and show that Peters's *H. ornatus* should be referred to that form rather than to the typical variety, to which I assigned it in 1882.

6. Crossarchus fasciatus (Desm.).

a, *b*. Ad. sks. Tschiromo, junction of Rivers Ruo and Shiré. 9/92.

C. fasciatus is recorded from Mt. Kilimanjaro by Mr. True under the name of *C. mungo*, Gmel.[1] That name is evidently taken from the synonymy of the species as given in my monograph of the African Mungooses[2], Mr. True rightly ignoring my plea for the retention of the name *fasciatus* merely as being classical, well-known, and appropriate. He does not, however, seem to be aware that the name *mungo*, originally given to a mixture of the common Indian Mungoose and the S.-African striped one, has been revived by Mr. Blanford[3] as the appellation of the former, in spite of my

[1] P. U.S. Nat. Mus. xv. p. 453 (1892).
[2] P. Z. S. 1882, p. 90.
[3] P. Z. S. 1887, p. 631; Mamm. Brit. Ind. p. 123 (1888).

own argument in favour of *Herpestes griseus*[1]. Even if, therefore, this barbarous name has to be used, it clearly cannot be applied to *two* species; and since Schreber's description of "Die Manguste—*Viverra ichneumon* β,"[2] on which *Viverra mungo*[3] was founded, has much more reference to the Indian than to the African animal, I am now of opinion, with Mr. Blanford, that the name of *mungo* should be used for the former, and, for more valid reasons than in 1882, *Crossarchus fasciatus* (Desm.) for the latter.

7. Canis sp. inc.

a. Yg. sk. Upper Shiré. 11/92.

Too young for determination.

8. Sciurus mutabilis, Pet.

a–e. 5 ad. sks. Zomba. 10/92.

Pending the arrival of specimens collected at other times of the year, I shall not express any opinion as to the cause of the considerable variation in colour existing among the present series of this Squirrel.

9. Gerbillus afer, Gray.

a, *b*. 2 ad. sks. Fort Johnston. 11/92.

10. Otomys irroratus, Bts.

a. Ad. sk. Upper Shiré. 11/92.

11. Golunda fallax, Pet.

a–e. 5 sks. Zomba. 10/92.

12. Mus (Dasymys) incomtus, Sund.

a, *b*. Ad. sks. Upper Shiré.

This rare species has been hitherto only obtained in Natal, although a closely allied and possibly identical form (*Mus nudipes*, Peters) has been described from Angola[4].

13. Mus rattus, var.

a. Ad. sk. Upper Shiré.

b–d. 3 yg. sks. Zomba. 10/92.

14. Mus dolichurus, Smuts.

a. Ad. sk. Tschiromo. 9/92.

b. Ad. sk. Zomba. 10/92.

15. Mus natalensis, A. Sm.

a. Ad. sk. Tschiromo. 9/92.

b. Ad. sk. Zomba. 10/92.

c–e. 3 ad. al. Milanji. 10/92.

[1] P. Z. S. 1886, p. 56 (ftnote).
[2] Schr. Säug. iii. p. 430 (1777).
[3] Gmel. Linn. S. N. i. p. 84 (1788).
[4] See Thos. Ann. Mag. N. H. (6) x. p. 180 (1892).

16. Mus musculus, L.

a, *b*. Ad. sks. Zomba. 10/92.
c. Ad. al. Milanji. 10/92.

17. Mus (Leggada) minutoides, A. Sm.

a–*c*. Ad. sks. Zomba. 10/92.

18. Cricetomys gambianus, Waterh.

a. Ad. sk. Zomba. 10/92.

19. Saccostomus campestris [1], Pet.

a. Ad. sk. Upper Shiré. 11/92.
b–*f*. Ad. & imm. al. Fort Johnston. 11/92.

20. Steatomys pratensis [1], Pet.

a–*c*. Ad. sks. Zomba. 10/92.
d. Ad. al. ♂. Milanji. 10/92.

These rare and peculiar short-tailed African Muridæ, with their doubtful affinities, are of the greatest interest, and it is probable that a clue to some of the most difficult problems of Murine phylogeny will be gained by a study of their teeth. For these reasons specimens of *Saccostomus* and *Steatomys* are most acceptable, and it is to be hoped that Mr. Whyte will also come across examples of the still rarer *Malacothrix* and *Mystromys*, approximately similar in size and proportions, but with very different teeth.

Although similar to each other superficially, these four last-named genera appear to belong to three different subfamilies—*Mystromys* seeming to be strictly Cricetine; *Steatomys*, as Alston has stated [2], being closely allied to *Dendromys*, as also are *Malacothrix* and *Dendromys*; while *Lophuromys*, *Saccostomus*, and *Cricetomys* ought, I believe, all to be placed in the restricted subfamily Murinæ. Of these last three the first was placed by Alston in the Dendromyinæ and the other two in the Cricetinæ.

21. Dendromys mesomelas, Bts.

a. Ad. sk. Zomba. 10/92.
b–*f*. 5 in al. Milanji.

These specimens, although I place them provisionally under the oldest name, *D. mesomelas*, certainly seem to differ constantly from the ordinary form of that species in being entirely without the black dorsal line and in being considerably smaller. In these respects they agree with two out of the previous collection, while two others are of the usual large-striped character. They thus correspond with Wagner's *D. pumilio*, described in 1841 [3], but afterwards [4] considered by him as a synonym of *D. mesomelas*. Larger series from different localities are, however, needed before one can

[1] For nomenclature see Ann. Mag. N. H. (6) x. p. 264 (1892).
[2] P. Z. S. 1876, p. 82.
[3] Münch. Gelehrt. Anzeiger, xii. p. 437.
[4] Schr. Säug. Supp. iii. p. 464 (1843).

be certain as to whether the absence of the black stripe is due to old age (as said by Smith), youth (as said by Wagner), season, or locality.

22. MYOSCALOPS ARGENTEO-CINEREUS, Pet.

a–j. 10 ad. & imm. sks. Zomba. 10/92.

23. POTAMOCHŒRUS LARVATUS, F. Cuv.

a. Ad. sk. & skull. Zomba.
b, *c*. 2 yg. sks. Zomba. 11/92.

24. BUBALIS LICHTENSTEINI, Pet.

a. Ad. sk. & skull. Zomba.

This specimen, equally with that mentioned in the previous paper (p. 553), has the whitish rump referred to by Dr. Matschie as characteristic of his *B. leucoprymnus*[1]. Since both individuals were obtained, however, at quite a short distance from the typical localities (Tette and Sena on the Zambesi) of Peters's species, there can be no doubt that they represent the true *lichtensteini*. Whatever therefore may be the differences in the horns between "*lichtensteini*" and "*leucoprymnus*," it is clear that the whiteness of the rump in the northern form cannot be used as a distinguishing character.

25. OREAS CANNA, H. Sm.

a. Ad. skull. ♀. Zomba.

26. HIPPOTRAGUS NIGER, Harr.

a, *b*. 2 ad. skulls. Zomba.

27. TRAGELAPHUS SCRIPTUS ROUALEYNI, Gord.-Cumm.

a–f. 6 skins. Zomba.

These specimens belong clearly to the Lower Zambesi form, their white markings, although very variable, being far less developed than in the Chobe River Bush-buck, assigned in 1891 to the true *T. scriptus typicus*, Pall.[2]

28. NANOTRAGUS SCOPARIUS, Schr.

a. Ad. sk. ♂. Zomba.

29. COBUS ELLIPSIPRYMNUS.

a–d. 4 skulls. Zomba.

30. CEPHALOLOPHUS GRIMMIUS, L.

a. Ad. sk. & skull. Zomba.

[1] SB. Ges. nat. Fr. 1892, p. 137.
[2] P. Z. S. 1891, p. 380.



J. Smit del. et lith.

Mintern Bros. imp.

FEMALE WATER-BUCK & YOUNG, (1893).

June 6, 1893.

Sir W. H. Flower, K.C.B., LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of May 1893:—

The total number of registered additions to the Society's Menagerie during the month of May was 165, of which 61 were by presentation, 8 by birth, 54 by purchase, 2 by exchange, and 40 on deposit. The total number of departures during the same period, by death and removals, was 104.

Amongst the additions I may invite special attention to the following:—

A young female Water-buck (*Cobus ellipsiprymnus*), born in the Menagerie May 4, 1893, being, so far as is known, the first Antelope of this species that has been bred in captivity.

For our pair of this beautiful species we are indebted to the liberality of Mr. G. S. Mackenzie, F.Z.S. The male was received June 30, 1890 (see P. Z. S. 1890, p. 589), and the female on May 26, 1891 (see P. Z. S. 1891, p. 326). Both of these animals were obtained in the territory of the British East African Company, where the species appears to be abundant (see Willoughby's 'East Africa and its Big Game,' page 288).

I exhibit a water-colour drawing by Smit (Plate XXXIX.) of this interesting young animal, which generally resembles the adult, though perhaps rather more rufous in colour.

The Council have resolved to present to Mr. G. S. Mackenzie the Silver Medal of the Society in recognition of this successful addition to the list of acclimatizable Antelopes.

The Hon. Walter Rothschild, F.Z.S., exhibited and made remarks upon the following objects:—

1. A specimen of the egg of the Duck-bill (*Ornithorhynchus anatinus*), stated to have been taken out of the pouch of the mother in Queensland.

2. The leg-bones of a large species of *Æpyornis* from South-western Madagascar, together with a perfect egg of the same extinct bird.

3. An enlarged photograph, by Mr. Williams of Honolulu, representing an enormous colony of Albatrosses on Laysan Island, in the North Pacific. The Albatross portrayed was the new species, *Diomedea immutabilis*, lately described by Mr. Rothschild, Bull. B. O. C. no. ix p. xlviii. The breeding-colony of this species was stated to occupy an area of nearly four square miles in Laysan Island. Another area of about two square miles in the same island was occupied by *Diomedea brachyura*.

4. A series of Lepidoptera from Jamaica, with their accompany-

ing larvæ. They were remarkable for their good preservation and excellent mounting.

5. A series of Diurnal Lepidoptera obtained by Herr Garlepp at a height of 17,000 feet on the Bolivian Andes.

Mr. Sclater exhibited some skins of Mammals obtained by Mr. H. H. Johnston, C.B., F.Z.S., Lieut. B. L. Sclater, R.E., Messrs. Buchanan, Bros., and Mr. A. Whyte, F.Z.S., in the Shiré Highlands, British Central African Protectorate, and made the following remarks :—

1. Cercopithecus albigularis.

Two flat skins of this Monkey obtained by Mr. B. L. Sclater from the natives near Blantyre, where the species was said to be common. We have also received several living examples of this species from Mombasa [1], and Mr. True has recorded its occurrence in the Kilimanjaro District (see my remarks above, p. 251). It is therefore certainly an East-African species, and I can hardly believe that the specimens from the Gold Coast referred to this species by Schlegel (Mus. des Pays-Bas, vii. p. 79) and Jentink (*op. cit.* xi. p. 20) can have been correctly determined.

2. Hippotragus niger.

A flat skin of an adult specimen of the Sable Antelope, which Mr. Johnston writes to me (Zomba, July 29, 1892) was shot in the plain between Zomba and Lake Shirwa.

My son also has brought home a fine head of this Antelope, which was obtained on the Portuguese bank of the Ruo, opposite Zoa. He also met with it in the plains between Zomba and Milanji, at an altitude of about 1800 feet.

3. Bubalis lichtensteini.

The Hartebeest, my son tells me, is found all over the Shiré Highlands, and is very abundant in some localities. It frequents the open grassy plains at all altitudes. It is often to be seen in company with the Zebra (*Equus burchelli*). I exhibit the head of an adult male.

4. Cobus ellipsiprymnus.

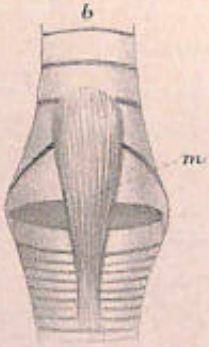
This Antelope, of which I exhibit several heads, is, as my son tells me, the most numerous of the tribe on all the lower plains. It is very abundant in the Elephant-Marsh between Chiromo and Katunga, and often ascends the lower hills. It is also common on the Upper Shiré, and on the Shirwa and Tochila plains, generally not far from water, but does not usually penetrate the higher hills.

[1] One from Mr. T. E. C. Remington, of Mombasa, received May 20, 1893, and others previously.

1.



2.



3.



4.



5.



6.



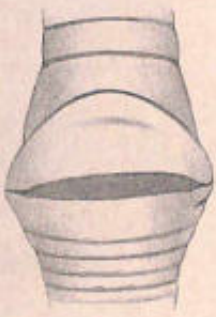
7.



8.



9.



J. Smit. del. et lith.

Mintern Bros. imp.

SYRINGES OF PSITTÆI.

5. Connochætes taurina.

The Gnu is stated by the natives to have been formerly plentiful on the plains between Milanji and Zomba. It is now very scarce, but Mr. B. L. Sclater saw it once on the Tochila plains, and obtained a tail of it from the natives in that district.

6. Tragelaphus scriptus roualeyni.

Three flat skins of this Bush-bok belonging to the subspecies, as described by Mr. Thomas, P. Z. S. 1891, p. 389.

My son informs me that this is one of the commonest Antelopes in the Shiré Highlands, being found in all parts of the country. It is excellent eating.

7. Tragelaphus angasi.

A flat skin of a female of this species obtained on the Moanza River, Lower Shiré, and presented to Mr. Johnston by Messrs. Buchanan, Bros.

I have already recorded the occurrence of this Antelope on the Moanza, from a skin procured by Mr. Sharpe (see P. Z. S. 1892, p. 98), but it is interesting to have confirmation of it.

Mr. B. L. Sclater, who was on the Moanza in September 1892, learned that the females of this Antelope (the "Bō" of the natives) congregate in large herds on the hilly country to the south of the river, while the males go about singly and are not easily met with.

8. Taurotragus oreas livingstonii.

The Striped Eland, my son tells me, is still common all over Southern Nyasaland, occurring in small herds of from 4 to 8, principally in the hills, but descending to the rivers to drink at early morning and evening. I exhibit two imperfect skins of it, which, like all those observed, are distinctly striped on the neck and withers.

The following papers were read:—

1. On certain Points in the Anatomy of Parrots bearing on their Classification. By Frank E. Beddard, M.A., F.R.S., and F. G. Parsons, F.R.C.S.

[Received June 6, 1893.]

(Plate XL.)

In the present paper we desire to direct the attention of the Society to certain points in the structure of the Parrots to which either little or no attention was paid by Garrod in his well-known essay on the systematic arrangement of this group[1]. Garrod

[1] P. Z. S. 1874, p. 586.

studied chiefly the ambiens muscle, the carotids, the gall-bladder, and the condition of the oil-gland; with the help of the variations afforded by the structures he propounded a scheme of classification of the group differing in many important particulars from the classifications in use before: he did not discuss, in the paper to which we now refer, the relations of the Parrots to other groups of birds; in this respect we shall follow his example and confine ourselves to an attempt to indicate affinities between different members of the group in the light of the facts which we record here for the first time. We prefer, however, rather to lay stress upon the new anatomical facts than to insist too much upon the accuracy of the grouping of the birds to which they appear to lead. It is very remarkable that Garrod should in this particular case have ignored the characters afforded by the syrinx, an organ which he was very fond of studying and using as a help to decide vexed questions of affinity: thanks chiefly to his interest in this organ we have been able to examine a very large series of syringes of many of the principal genera, which he collected together during his tenure of the Prosectorship of this Society; to these a few were doubtless added by Forbes, and we have carefully preserved those of such birds as happened to die during the course of the present research; so that on the whole we can claim to have seen a fair number of illustrative genera; the organ, too, in our opinion shows useful, because easily definable, characters for systematic purposes. We shall commence by giving some account of the syrinx in a number of illustrative genera.

§ *Syrinx.*

The syrinx of the Psittaci seems to show two main varieties.

a. In the following species there is a syrinx of the type which is illustrated in Plate XL. figs. 4, 5 (*Cacatua cristata*):—

Cacatua cristata.
—— *triton.*
—— *philippinarum.*
Microglossa aterrima.
Calyptorhynchus banksi.
Stringops habroptilus.

The syrinx is in these species remarkable for the fact that the first semirings of the bronchi are weak and cartilaginous and are usually separated from each other by considerable tracts of membrane. *Cacatua* itself represents the most extreme type; in *Cacatua cristata*, for example (see Plate XL. fig. 4), when the syrinx is seen on a lateral view the membrane occupies a great deal of the outer lateral region of the commencement of the bronchus.

The figure to which we have just referred exhibits the syrinx with the intrinsic muscles cleaned away, but the point of attachment of the muscle is indicated by the circle (*a* in the figure); it will be seen from an inspection of that figure that the semirings of

the bronchus are at first very small and do not extend across the side of the bronchus; they gradually increase in length, until at the sixth or seventh they come to extend right across the syrinx. In *Microglossa aterrima* the syrinx is in certain respects less abnormal; the rings are still feeble, but on a lateral view of the organ they extend completely across, and there is on such a view no bare tract of membrane such as we have figured in *Cacatua*.

Calyptorhynchus banksi is intermediate between the two extremes; the first semiring only is incomplete, inasmuch as it does not reach from one side of the syrinx to the other—or rather we should say from the anterior to the posterior side.

Stringops habroptilus (fig. 3) has the same weak cartilaginous bronchial semirings; but on a lateral view of the syrinx they are seen to extend right across.

b. The second group contains, so far as we can say from first-hand knowledge, the following genera:—

Chrysotis.	*Tanygnathus*.
Pyrrhulopsis.	*Eos*.
Trichoglossus.	*Polytelcs*.
Lorius.	*Platycercus*.
Pionus.	*Pœocephalus*.
Psittacus.	

These genera, of several of which we have examined more than one species, are differentiated from those of the first division by the fact that the bronchial semirings are as a rule ossified and are frequently more or less fused together; at the same time the first ring is commonly concave upwards, whereas in the Parrots of the first mentioned group the bronchial semirings are straight.

The most extreme type is perhaps offered by *Chrysotis*; of this genus we have seen the following species:—

Chrysotis versicolor.
—— *erythrura*.
—— *leucocephala*.
—— *bodin*.
—— *viridigenalis*.
—— *levaillanti*.

In all these species (Plate XL. fig. 7) the first two rings of the bronchus are closely fused together and form a bowed piece of bone forming with the last tracheal ring a semicircular outline; the space between the two is of course occupied by membrane. In *Chrysotis levaillanti* for instance, and there is no great difference in the other species, the double character of the apparently single first bronchial semiring is only to be seen at the two ends. In a number of other Parrots the first bronchial semiring is larger than that which follows though not fused with it; this is the case with *Trichoglossus*, *Pyrrhulopsis*, and *Chalcopsitta*; the genera *Eos* (figs. 1, 2), *Polytelcs*, *Platycercus*, and *Tanygnathus* have syringes which are constructed on the same plan. In *Conurus* there is a

little difference; here the first two rings of the bronchus are equi-sized; this at any rate applies to the two species *Conurus aureus* and *Conurus cruentatus*, which are the only two that we have examined from this point of view. The genus *Ara* (species *Ara leari* (fig. 6), *Ara militaris*) agrees with *Conurus*. *Psittacus* (fig. 8) is like these genera; but *Pionus* (fig. 9) agrees more closely with *Chrysotis*.

It will be obvious from what we have said and from the illustrations of the syrinx which accompany this paper that no hard-and-fast line can really be drawn between the two groups into which we divide the Parrots; if it were thought desirable to draw such a line it would be between the genus *Cacatua* on the one hand and all the remaining Parrots on the other. *Cacatua* alone has a syrinx in which the first bronchial semirings are incomplete leaving a bare tract laterally which is easily visible when the syrinx is viewed from the side; but in this genus there is another peculiarity which we have not yet referred to—the intrinsic muscle of the syrinx (fig. 5, *m*) ends in a very narrow point which passes into a fine tendon of attachment; in *Chrysotis*, *Eos* (fig. 2, *m*), &c., the muscle is comparatively broad down to its actual attachment. In this particular *Microglossa* and *Stringops* agree with *Cacatua*, although they do not show the incomplete rings that have been mentioned as characteristic of the latter genus. These genera in fact are to this extent intermediate between *Cacatua* and the more normal (at any rate more usual) form of syrinx in the Parrots; the rings are still, however, soft and cartilaginous, thus different from *Conurus*, which is a further step in the direction of *Chrysotis*; *Chrysotis* seems to represent the opposite extreme to *Cacatua*. *Ara* is a genus which is also intermediate in the characters of its syrinx, it has weakish and straight rings, as in *Stringops* for instance; but the muscles are as in the second group of Parrots, and the general aspect of the syrinx is more in accord with this placing of it.

§ *Myology*.

We find that the Parrots are very much alike in their myology; there are, however, a few points in which they show differences and which may be useful for the purposes of classification. In the first place, the arrangement of the tendons of the tensor patagii varies considerably. Speaking generally (see Fürbringer, Morph. v. Syst. d. Vögel, Taf. xxii. figs. 4, 5, 6: *Sittace*, *Psittacus*, *Cacatua*) this muscle ends in a broad aponeurosis which lies between the two layers of skin of the patagium, and in this aponeurosis are three thickened bands which run down to the forearm to join the tendon of the extensor longus at right angles; from the lower margin of this transverse tendon another slip runs down to the ulna, having the same course as the patagial tendons, but not being necessarily in the same line with any of them. The anterior patagial tendon usually curves forwards near its lower attachment and the posterior slightly backwards; in addition to this the

anterior and middle tendons are usually fused in the upper part of their course.

Another point which we noticed about the tensor patagii was that in some cases it completely covered the posterior deltoid muscle and in others left it more or less exposed.

In addition to the amount of exposure of the posterior part of the deltoid, we found that the two parts of that muscle varied in their relative sizes to one another.

The last point that we noticed in the myology of the arm was the presence or absence of the lower head of the anconeus; when this was found it was attached to the shaft of the humerus either in front of or very slightly above the insertion of the latissimus dorsi and altogether below the tubercle for the attachment of the pectoralis minor.

The lower head of the anconeus is present in the following six genera—*Cacatua*, *Nestor*, *Stringops*, *Pyrrhulopsis*, *Ara*, and *Calyptorhynchus*; while in the following twenty-one it is absent—*Chrysotis*, *Deroptyus*, *Psittacula*, *Aprosmictus*, *Pœocephalus*, *Caica*, *Tanygnathus*, *Eos*, *Eclectus*, *Lathamus*, *Palæornis*, *Loriculus*, *Psephotus*, *Lorius*, *Conurus*, *Coracopsis*, *Cyanorhamphus*, *Pionopsitta*, *Bolborhynchus*, *Platycercus*, and *Psittacus*.

In all the genera in which we have found a lower head to the anconeus, the posterior deltoid was only partially covered by the posterior edge of the tensor patagii; while among those in which the lower head was not found, the deltoid was completely covered, with the following exceptions—*Eclectus*, *Coracopsis*, *Pionopsitta*, and *Bolborhynchus*. In the latter, however, the muscle only just appeared behind the edge of the tensor patagii. In the five genera in which the lower head of the anconeus was found, the posterior deltoid was larger than the anterior with the exception of *Pyrrhulopsis*, in which also the lower head of the anconeus was but slightly marked.

In the genera in which no lower head was found to the anconeus the rule seems to be that the anterior deltoid is larger than the posterior; the following are exceptions:—*Coracopsis*, in which the posterior is the larger; and *Pœocephalus*, *Eclectus*, and *Bolborhynchus*, in which the two deltoids are of equal size.

The arrangement of the tendons of the tensor patagii is very much the same in *Nestor*, *Stringops*, and *Calyptorhynchus*; in all three the tendons are relatively very long when compared with the fleshy part of the muscle, and they are all close to one another, so as to give the appearance in *Stringops* of one tendon. In *Calyptorhynchus* the anterior tendon leaves the others in the lower part of the patagium and runs forwards after its usual fashion, so that the main distinctive point of these three genera, as far as the tensor patagii goes, is that the middle and posterior tendons are close together. In *Coracopsis* these tendons are separated by a slight interval, but closely correspond to the arrangement in the birds last named.

Eos, *Lorius*, *Pœocephalus*, and *Caica* have a characteristic and

almost uniform arrangement of the patagial tendons. In them the three tendons are very difficult to distinguish because the fibrous membrane between them, of which they are only specialized parts, is as thick as they are. The result is that in these birds the patagial muscle seems to be inserted by a broad, short, membranous-looking tendon.

Conurus shows a transitional stage between these last genera and the typical arrangement; the three tendons are more distinct, but they are equally short and show the same mode of attachment to the fleshy part of the muscle.

Lathamus is remarkable for having the anterior tendon separate in its whole length from the middle one, instead of being fused with it in the upper part of its course.

Chrysotis and *Bolborhynchus* have a small extra tendon between the middle and posterior ones; in *C. guildingi* this was only present on one side, but in *C. leucocephala* it was found on both.

Psittacus has three tendons which are completely separate in the whole of their course, and in this respect it corresponds to *Lathamus*. We are, however, inclined to look upon the anterior tendon as representing the fused anterior and middle tendons of *Lathamus*, and to regard the middle tendon as an extra one as in *Chrysotis*. Our reasons for this are that there is a considerable interval between the two tendons, and that they do not diverge as in all other cases. If this view is correct, the patagial tendons of *Psittacus* closely resemble those of *Chrysotis*, while they also agree in having the anterior deltoid larger than the posterior, in the absence of a lower head to the anconeus, and in having the deltoid completely covered by the tensor patagii.

Tibialis anticus.—The tibialis anticus in almost all the genera which we examined was inserted by a single tendon except in *Chrysotis* (of which two species were examined), where this tendon was double. The only genus which resembled *Chrysotis* was *Psittacus*, in which the tendon was really double; but the two parts, although easily separable, were slightly connected together. In several other genera we detected a slight line of demarcation in the tendon, but it was not sufficiently definite for us to regard it as of any classificatory value.

Peroneals.—The peroneus longus and brevis are, as far as we have observed, always present in Parrots, but the origin of the former differs somewhat in different genera.

In *Stringops* and *Nestor* the peroneus longus rises from the front of the bony fibula and its membranous continuation for about the upper half of the leg. The muscular belly overlaps that of the peroneus brevis very much near its origin, and the muscle is large and well marked.

In *Chrysotis*, on the other hand, the peroneus longus is very small and only rises from the membranous continuation of the fibula in the lower part of the leg; it is so small that it does not overlap the peroneus brevis at all but lies behind it.

Gadow[1] describes the peroneus longus as apparently absent in *Chrysotis*.

In the other genera examined the muscle is intermediate between *Stringops* and *Chrysotis*; it rises from about the middle third of the leg as high as the tip of the bony fibula, and only slightly overlaps the peroneus brevis. The insertion of the peroneus longus is always into a strong fibro-cartilaginous ring which surrounds the deep flexor tendons opposite the ankle-joint and is attached to the base of the tarso-metatarsus.

The peroneus brevis varies very little; it rises from the outer surface of the tibio-tarsus and is inserted into the outer part of the posterior surface of the base of the tarso-metatarsus. In *Chrysotis*, where the peroneus longus is so small, it is larger than usual.

We do not propose to produce as a result of the above notes a complete scheme of classification of the *Psittaci*: in the first place we have been unable to see a good many types which ought to be studied before a general scheme should be propounded; and in the second place we have only called attention to certain points in the anatomy of the group. It may, however, be pointed out that the material which we have gathered together in this paper, combined with what we know through the researches of the late Professor Garrod, bring up our knowledge of the anatomy of the Parrots to a higher level than that of many other groups of birds; the facts accumulated in the papers referred to will at any rate serve some one who can supplement them by the observation of other genera with a mass of information upon which a definite scheme can be made out. In the meantime, however, we may indicate a few questions of affinity as to which our investigations appear to throw some light. In the first place, there is the remarkable genus *Stringops*: there is no doubt that its purely terrestrial habits have led to some degeneration; it has, for example, a flat sternum; but degeneration of this kind would hardly be expected to affect such organs as are treated of here with the exception, of course, of the muscles of the patagium. It is perhaps a noteworthy point that on the whole the musculature of the arm as far as we have studied it is like that of *Nestor*, a Parrot which of course occurs in the same part of the world; the agreement as to these muscles also extends to *Calyptorhynchus*, in which genus the syrinx also is fashioned after the plan characteristic of *Stringops*: this is also of importance; these two genera are, from our point of view, the nearest allies of *Stringops*, which does not, in so far as the facts treated of here have weight, occupy nearly so isolated a position in the system as has been assigned to it by others[2].

To a great extent, therefore, our results bear out Prof. Garrod's

[1] Bronn's Klassen u. Ordn. d. Thierreichs, Aves, p. 18.

[2] *E. g.* in Mr. Sclater's classification used in the "List of Animals." Fürbringer (J. f. O. (4) xxxvii. p. 241) puts *Stringops* down as a primitive, if not the most primitive, Parrot.

views upon the position of *Stringops*. He regards it, it is true, as a member of a subfamily (*Stringopinæ*) distinct from the *Cacatuinæ*; but both these subfamilies are within one family, *Palæornithidæ*. We quite agree with Prof. Garrod's remark about *Stringops* (P. Z. S. 1874, p. 596) that "as a Parrot it is not so strikingly peculiar as many seem to think. Its wings are useless, and the carina sterni is correspondingly reduced, it is true; but as points of classificational importance, I regard these as insignificant."

The association of *Cacatua* with *Microglossa* and *Calyptorhynchus* is confirmed, though *Cacatua* is perhaps farther off either of these two than they are from each other.

Ara, too, we find to be rather nearer than some have thought it to certain of the Old World genera, such as *Nestor*, *Stringops*, and *Calyptorhynchus*. Considering the superficial resemblance which the Macaws bear to the Cockatoos, this result is of not a little interest.

EXPLANATION OF PLATE XL.

SYRINGES OF PARROTS.

Fig. 1, 2. *Eos reticulata.*
3. *Stringops habroptilus.*
4, 5. *Cacatua cristata.*
6. *Ara leari.*
7. *Chrysotis erythrura.*
8. *Psittacus temneh.*
9. *Pionus violaceus.*

In figs. 2 & 3 only the intrinsic muscle (*m*) is shown.

2. On some Horns belonging, apparently, to a new Form of African Rhinoceros. By P. L. SCLATER, M.A., Ph.D., F.R.S., Secretary to the Society.

[Received June 2, 1893.]

My friend Mr. Frederick Holmwood, C.B., C.M.Z.S., H.B.M. Consul-General at Smyrna, has kindly lent me for examination two very remarkable horns of an African Rhinoceros, which he obtained at Zanzibar, when Consul-General there a few years ago. Mr. Holmwood gives me the following account of them:—

"From a very careful description of the country I gathered that they came from the country of 'Udulia,' situated at the N.E. point of Usukuma, 50 miles S. of Speke Gulf. The native traveller whom I bought them of thought, however, that the district, which is a jungle interspersed with grassy plains, might form part of the large pastoral country to the W. of Udulia, called by various names, but known generally by caravans as 'Uturu.' He said it was the only district where this Rhinoceros was known. It is only inhabited by hunters whom he described as dwarfs, but I do not take this for granted."

Fig. 1.

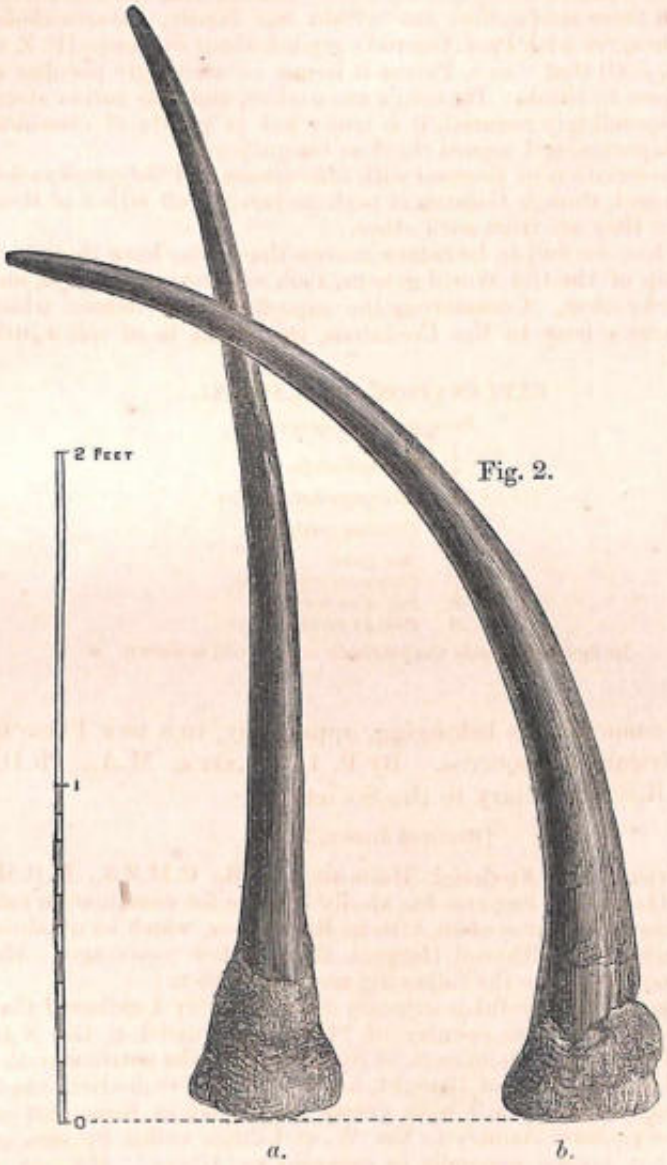


Fig. 2.

Front horns of Holmwood's Rhinoceros.

The question is to what species of Rhinoceros these two horns (which I now exhibit) are to be referred. It will be seen that they are remarkable for their length, thinness, and especially for their comparative roundness and their small size at the base.

Since the publication of Mr. F. C. Selous's excellent paper on the African Rhinoceroses (P. Z. S. 1871, p. 725), it has been generally agreed by naturalists that there are only two known species of this genus in Africa—the Black Rhinoceros (*R. bicornis*) and the White Rhinoceros (*R. simus*). Of the Black Rhinoceros a fine series of horns has been figured by Mr. Selous (*l. s. c.*), showing the variations that exist in the comparative length of the anterior and posterior horns. The anterior horn of the Black Rhinoceros, though, save in very exceptional cases, always longer than the posterior horn, seldom reaches more than 24 inches in length, though occasionally longer[1]. On the other hand, the front horn of *R. simus* grows, as is well known, to an extraordinary length, varying from 18 to 48 inches, and reaching even 57 inches in abnormal specimens. This horn is, however, of great thickness at the base and much more compressed laterally than is the case with the specimens now in question, and in fact of quite a different character. Moreover *R. simus*, now almost extinct[2], has never been known to occur north of the Zambesi. It is not possible, therefore, to refer Mr. Holmwood's specimens to *R. simus*. There remains the question whether they can belong to abnormal individuals of *R. bicornis*, to which form of Rhinoceros they would appear from general characters to be most nearly related. Before considering the question I will shortly describe the specimens.

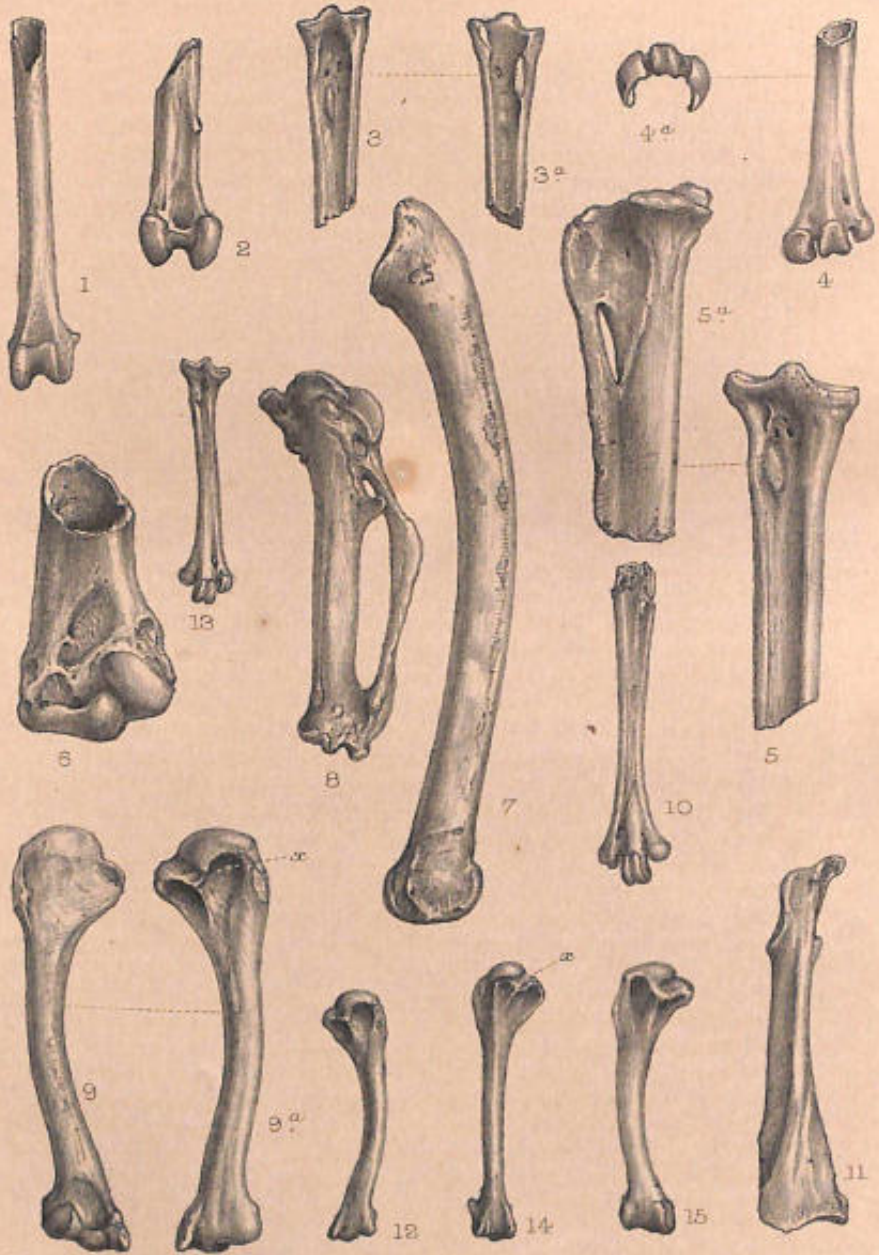
a (*fig.* 1) is 42 inches in length from the base of the thickened pedicel along the curve to the top of the horn. The pedicel is nearly circular, about 5 inches across on its lower surface. It is rounded, not flattened in front. At about 5½ inches from the base the true horn emerges from the pedicel; here it is ovate in shape, about 2·5 from front to back and 2·1 from side to side. It is nearly straight at the base, but curved gently backwards in the last third of its length. It is very smooth and of a uniform dark brownish black in colour.

b (fig. 2) is generally similar, but not quite so long (41 inches), thicker at the base, where the horn emerges from the pedicel, and much more rapidly curved backwards. It is also much paler in colour.

On comparing these horns with anterior horns of the Black Rhinoceros (two pairs of which Mr. Selous has kindly lent me for the purpose), it will readily be seen that they are at once recog-

[1] There are two horns in the British Museum, referred to this species (1520 *h* and 1520 *i*), 42 and 40 inches in length respectively. See Hand-l. Edent. p. 52 (1873).

[2] A recent letter, addressed to the 'Field' by Mr. Selous (Field, vol. 80, p. 803, Nov. 26th, 1892), shows that the White Rhinoceros still exists in Northern Mashonaland, a herd of six having been met with by Messrs. Eyres and Coryndon about 100 miles N.W. of Salisbury.



Bergeau & Highley del. et lith.

West, Newman imp.

Bird-bones from Grive-St-Alban.

nizable by their great length, their thinness, and the small size of the pedicel.

I am told that these peculiar horns are well known as articles of trade at Zanzibar, where they are brought by the caravans from the interior. I do not propose to found a new species on them, because it is possible that they may be abnormal horns of the female Black Rhinoceros, which we know is found all through Eastern Africa up to the White Nile and plains of Upper Nubia[1]. But it is highly probable that they belong to a different animal, of which we may hope some day to receive perfect specimens. In the meantime they may be provisionally named Holmwood's Rhinoceros, *Rhinoceros bicornis holmwoodi*.

3. On some Bird-bones from the Miocene of Grive-St.-Alban, Department of Isère, France. By R. Lydekker.

[Received May 17, 1893.]

(Plate XLI.)

For the second time I am indebted to my friend Dr. C. J. Forsyth Major for the opportunity of adding something to our knowledge of the fossil birds of Europe—the small collection which he has on this occasion confided to my care having been obtained from the Miocene beds of Grive-St.-Alban, in the Isère. Those beds belong to the middle division of the Miocene period, and probably correspond approximately in age to those of Sansan in the Gers. So far as I am aware, the only bird-remains hitherto recorded from the Grive-St.-Alban deposits are a few described by Dr. C. Depéret[2]. These remains, which are but few in number, were regarded as indicating the existence of an undetermined Accipitrine of the size of the Common Buzzard; of a peculiar species of Woodpecker (*Picus gaudryi*); of a Pheasant, identified with a species (*Phasianus altus*) described by M. A. Milne-Edwards from the Sansan deposits; of a smaller representative of the same genus; of a Gallinaceous bird referred to the Lower Miocene genus *Palaortyx*, under the name of *P. edwardsi*; of a Crane, provisionally identified with *Grus pentelici* of the Pikermi beds; and of an undetermined Anserine. The collection of specimens obtained by Dr. Forsyth Major is far more numerous, and contains several bones in a perfect state. Others, however, are very fragmentary and difficult of identification; and I have accordingly thought it well to refer in most cases only to such specimens as I have been able to identify with a fair amount of certainty. As I have had occasion to mention previously, our collections of Avian osteology are at present in such an unsatisfactory condition that the determination of complete (not to say

[1] See Baker, 'Nile-Tributaries,' p. 246 (1872).
[2] Arch. Mus. Lyon, vol. iv. pp. 282–288 (1887).

of imperfect) bones is frequently a matter of extreme difficulty, if not of actual impossibility.

STRIX SANCTI-ALBANI, n. sp. (Plate XLI. figs. 1–4.)

In the British Museum Catalogue of Fossil Birds I took the family *Strigidæ* to include all the members of the nocturnal birds of prey, but I have since seen reason to adopt the subdivision of the group into the families *Strigidæ* and *Bubonidæ*. And I am the more confirmed in this latter view from the circumstance that the specimens under consideration show an osteological distinction between the members of those two families which I have not observed recorded in the works with which I am familiar.

Of all the birds represented in the collection the one of which the remains are most numerous is a species of Owl belonging to the genus *Strix*—no less than eleven more or less imperfect bones being referable to this form. From these specimens I have selected four for illustration (see Plate XLI.)—those represented in figures 1 and 2 being the distal portions of the right tibia, while those in figures 3 and 4 are respectively the proximal and distal halves of the left tarso-metatarsus. The Strigine affinities of these specimens are amply demonstrated by the form of the lower end of the tibia, in which the condyles are remarkably prominent, while there is no bridge over the extensor groove on the anterior aspect; and likewise by the highly convex arch formed by the distal trochleæ of the tarso-metatarsus, and the general form and prominence of the crest on the hinder part of the hypotarsus. Although I am not aware that any sharply defined distinction can be drawn between the tibia of the *Bubonidæ* and *Strigidæ*, I find that *Strix* differs from all the members of the former that I have been able to examine in the absence of the bony bridge over the extensor depression of the upper part of the anterior face of the tarso-metatarsus. As this bridge is wanting in the specimens before us (fig. 3), and as they agree otherwise in general form and size with the corresponding bones of the Barn-Owl, I opine that they must be referred to the genus *Strix*. Agreeing in size with the corresponding elements in *S. flammea*, they are distinguished by the grooves between the distal condyles of the tibia being somewhat less deep; while the tarso-metatarsus has a deeper posterior groove and a smaller crest to the hypotarsus. The only fossil representative of the genus which, so far as I am aware, has received a distinct name is *S. melitensis*[1], founded on a femur from the Pleistocene of Malta, which differs from that of *S. flammea* in its more slender proportions. As there are no indications of a similar slenderness in the bones under consideration, I think I shall be justified in assigning them to a new species, under the name of *S. sancti-albani*. The specimens do not, however, admit of defining the species more exactly than by the above-mentioned features in which it differs from *S. flammea*.

[1] Lydekker, Cat. Foss. Birds Brit. Mus. p. 13 (1891).

PHASIANUS ALTUS, Milne-Edwards. (Plate XLI. figs. 5–8.)

As already mentioned, Dr. Depéret has referred to this species certain remains from St. Alban, and four specimens in the present collection seem to fully justify this determination. The bones on which this species was originally founded were but very imperfect, and our knowledge of its osteology was advanced by those described by Dr. Depéret, which included the lower end of the tibia, the upper extremity of the tarso-metatarsus, a part of the upper end of the femur, and some fragments of the metacarpus. The specimens in the present collection comprise the proximal part of the left tarso-metatarsus (Plate XLI. figs. 5, 5 *a*), the distal end of the left humerus (fig. 6), the entire left ulna (fig. 7), and the complete left metacarpus (fig. 8). From their all pertaining to the left side it seems not improbable that all the four are portions of a single bird.

These bones agree with those previously described in indicating a bird of considerably larger size than the Common Pheasant, being in fact intermediate in size between that species and the Peacock. They also decisively confirm the reference of the species to the genus to which it is assigned[1]. For instance the intermetacarpal bar of the metacarpus (which of itself sufficiently indicates the gallinaceous nature of that bone) is far smaller than in *Pavo*, and comes nearest in this respect to *Phasianus*; while the proximal part of the tarso-metatarsus has the same narrow shape as in the latter, with a deeper groove and one more ridge on its posterior surface than in *Pavo*. Other characteristic features of *Phasianus* are the single and prominent tubercle for the insertion of the tibialis anticus, the opening of the two superior perforations on the same horizontal line, the large size of the tibial cups and the comparatively small tubercle between them, and also the single tube and two shallow grooves in the hypotarsus. The diameter of the proximal extremity of this specimen is 0,017 mm., against 0,016 mm. in the one described by Dr. Depéret; while both in his and the present specimen of the metacarpus the diameter of the proximal extremity is 0,015. Beyond stating that the length of the ulna is 0,094 mm., while the transverse diameter of the distal end of the humerus is 0,0205 mm., the other specimens do not call for further mention.

PALÆORTYX EDWARDSI, Depéret. (Plate XLI. figs. 9, 10.)

The Gallinaceous birds from the Upper Eocene of Paris and the Lower Miocene of the Allier described by M. Milne-Edwards under the name of *Palæortyx* are easily recognized, among other characteristics, by the large size of the tricipital fossa of the humerus, which extends for a considerable distance under the head. In this feature these birds resemble to a certain extent the living

[1] I may mention that, as is frequently my custom, I determined the genus of these bones before referring to the description of the birds previously recorded from the formation whence they were obtained.

Ammoperdix, *Ortyx*, and *Coturnix*, while they are totally different from *Caccabis*, *Perdix*, *Phasianus*, and most other members of the group. Probably the extinct *Palæoperdix*, of the Sansan beds, had a similar type of humerus, but the tarso-metatarsus is of a less flattened type. To the genus *Palæortyx*, Dr. Depéret has referred two imperfect humeri from Grive-St.-Alban, with which a complete specimen in the present collection agrees; and as the associated specimens of the tarso-metatarsus appear to present the characters distinctive of that genus, I am disposed to accept his determination.

The right humerus (represented in figs. 9, 9 *a* of Plate XLI.) agrees precisely with the distal half of the corresponding bone figured by Dr. Depéret in pl. xiii. fig. 51 of vol. iv. of the Arch. Mus. Lyon, as one of the types of *Palæortyx edwardsi*; while its proximal portion appears to correspond with that portion of another right humerus depicted in fig. 52 of the above-cited plate. In total length the humerus here figured measures 0,055 mm., or somewhat more than the corresponding bone of *P. blanchardi*, Milne-Edwards, from the Allier Miocene, in which the length is 0,047. According to Dr. Depéret the humerus of *P. edwardsi* differs from that of the last-named species not only in its superior size, but likewise in the absence of a distinct prominence on the outer side of the head. Compared with the corresponding bones of *Ammoperdix* and *Ortyx*, the present specimen, although much larger, is generally very similar, although there are certain differences which are evidently of generic value. The large size of the tricipital fossa differentiates the specimen from the existing Oriental *Cryptonyx*, and the extinct *Palæocryptonyx* from the Pliocene of Roussillon [1].

The right tarso-metatarsus (represented in fig. 10), of which the proximal extremity is imperfect, is evidently that of a partridge-like gallinaceous bird, and as it agrees approximately in relative size with the humerus, it may be tentatively assigned to the same distinctive species. Since it appears to present all the characters of *Palæortyx* rather than of *Palæoperdix* [2], it confirms Dr. Depéret's reference of the species under consideration to the former rather than to the latter genus.

PALÆORTYX MAXIMA, n. sp. (Plate XLI. fig. 11.)

The slightly imperfect right coracoid of a gallinaceous bird (represented in fig. 11), being of too large dimensions to have belonged to the same species as the humerus above mentioned [3], while it agrees in all essential characters with the corresponding bone of *Palæortyx*, *Ammoperdix*, and *Ortyx*, may be taken to indicate a second species of the first-named genus, distinguished from all the others by its superior size. The length of this coracoid

[1] Depéret, Comptes Rendus, vol. cxiv. p. 691 (1892).
[2] See Cat. Foss. Birds Brit. Mus. p. 137.
[3] In *P. gallica*, of which the humerus measures 0,042, or 0,005 less than the corresponding bone of *P. blanchardi*, the length of the assigned coracoid is only 0,025.

is upwards of 0,050 mm.; and this must for the present serve as the distinctive feature of this species.

PALÆORTYX GRIVENSIS, n. sp. (Plate XLI. fig. 12.)

The right humerus (represented in fig. 12) indicates a species of the size of the Common Quail, and somewhat inferior in this respect to *P. brevipes*, which is the smallest of the Allier representatives of the genus. Thus, whereas in the present specimen the length is 0,0337 mm., in the corresponding bone of *P. brevipes* it is 0,0357 mm. On account of this inferiority of size, coupled with its much higher geological horizon, I am disposed to regard the present specimen as indicating a distinct species, which I assign to *Palæortyx*, with the name of *P. grivensis*. Compared with the nearly equal-sized humerus of *Coturnix*, this specimen exhibits very clearly the distinctive features between the two genera. Thus whereas in the Quail the subtrochanteric fossa is much larger than the shallow tricipital fossa, and extends beneath it, in *Palæortyx* the latter is much the larger of the two, and is of such a depth as to prevent the former from extending beneath it towards the outer side of the bone.

PALÆORTYX, sp. inc. (Plate XLI. fig. 13.)

Seeing that in the Common Quail the humerus is of almost exactly the same length as the corresponding bone of *P. grivensis*, while the tarso-metatarsus measures only 0,027 mm. in length, it would seem impossible that the tarso-metatarsus now exhibited (see fig. 13), of which the length is 0,032 mm., can belong to the species last named. I accordingly regard it as probably indicating yet another species of the genus from La Grive, nearly of the same size as *P. brevipes* of Allier, but to which I do not consider it advisable to assign a distinct name. In its comparative flatness, as well as in the straightness of the hypotarsus and the depth of the external posterior groove, this bone exhibits all the features characteristic of *Palæortyx* as distinct from *Palæoperdix*.

TOTANUS MAJORI, n. sp. (Plate XLI. fig. 14.)

From the presence of a distinct triangular ectepicondylar process, the small left humerus (represented in fig. 14) is clearly referable to the Gaviæ, Limicolæ, or Tubinares. From the corresponding bone of the more typical *Laridæ* it is readily distinguished by the smaller size of the tricipital fossa; while it differs from that of *Sterna* in the larger size of the ectepicondylar process. Compared with a skeleton of the Yellow-footed Sandpiper (*Totanus flavipes*), it is found to agree so closely with the humerus that there can be little hesitation in referring it to a member of the same genus. The total length is 0,037 mm., or about one-fourth less than that of the corresponding bone of the species above-named. A small species of *Totanus* from the Allier Miocene has been named *T. lartetianus* by Milne-Edwards; but as the higher geological

horizon of the present specimen may be taken as an almost certain indication of its distinctness from that form, I propose to regard it as representing a new species, under the name of *T. majori*. In the absence of a specimen of the humerus of *T. lartetianus* available for comparison, I am, however, unable to point out the distinctive differences of the present bone.

Undetermined Specimens.

Among the undetermined specimens there are several complete bones undoubtedly referable to small Passerines, although the materials available to me do not admit of any satisfactory attempts at their generic discrimination. In figure 15 of Plate XLI. I have, however, figured a left humerus which may be Picarian, in the hope that some one better acquainted with the osteology of these groups of birds may be able to determine its affinities.

EXPLANATION OF PLATE XLI.

Fig. 1. *Strix sancti-albani*. Back view of distal half of the right tibia.
2. *Strix sancti-albani*. Front view of the distal portion of the right tibia.
3, 3*a*. *Strix sancti-albani*. Front and back views of proximal half of the left tarso-metatarsus.
4, 4*a*. *Strix sancti-albani*. Front and lower views of the distal portion of the left tarso-metatarsus.
5, 5*a*. *Phasianus altus*. Anterior and inner aspects of proximal portion of the left tarso-metatarsus.
6. *Phasianus altus*. Palmar aspect of distal extremity of the left humerus.
7. *Phasianus altus*. The left ulna.
8. *Phasianus altus*. The left metacarpus.
9, 9*a*. *Palæortyx edwardsi*. Palmar and posterior aspects of right humerus. *x*, tricipital fossa.
10. *Palæortyx edwardsi*. Anterior aspect of the imperfect right tarso-metatarsus.
11. *Palæortyx maxima*. Anterior aspect of the slightly imperfect right coracoid.
12. *Palæortyx grivensis*. Posterior aspect of the right humerus.
13. *Palæortyx*, sp. inc. Front view of the left tarso-metatarsus.
14. *Totanus majori*. Posterior aspect of the left humerus. *x*, tricipital fossa.
15. Posterior aspect of the left humerus of an undetermined (? Picarian) bird.

All the specimens were obtained from the Middle Miocene of Grive-St.-Alban, and are drawn of the natural size.

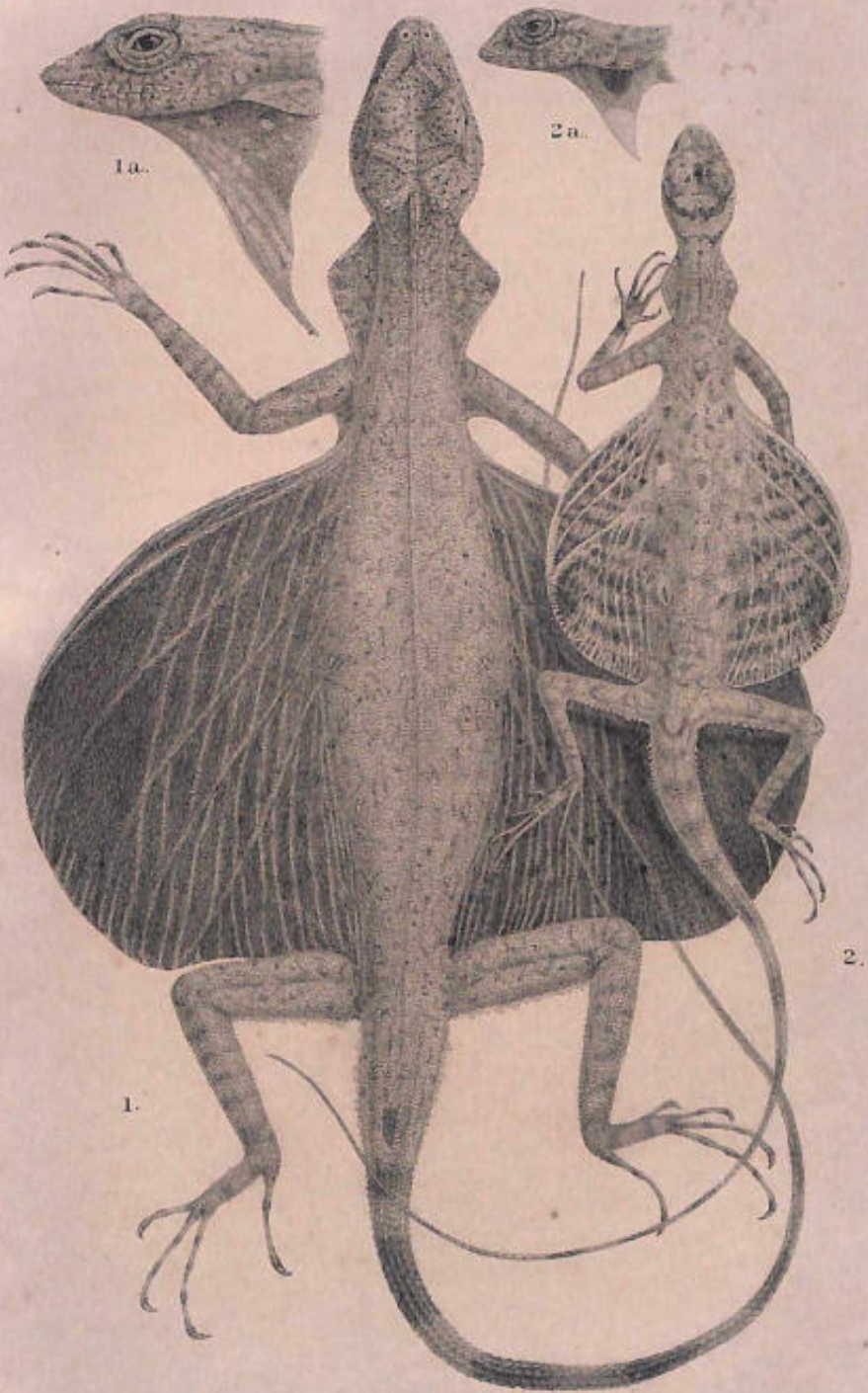
4. Descriptions of new Reptiles and Batrachians obtained in Borneo by Mr. A. Everett and Mr. C. Hose. By G. A. Boulenger.

[Received June 2, 1893.]

(Plates XLII.–XLIV.)

Draco maximus. (Plate XLII. fig. 1.)

Head small; snout as long as the diameter of the orbit; nostril directed upwards, perfectly vertical; tympanum covered with

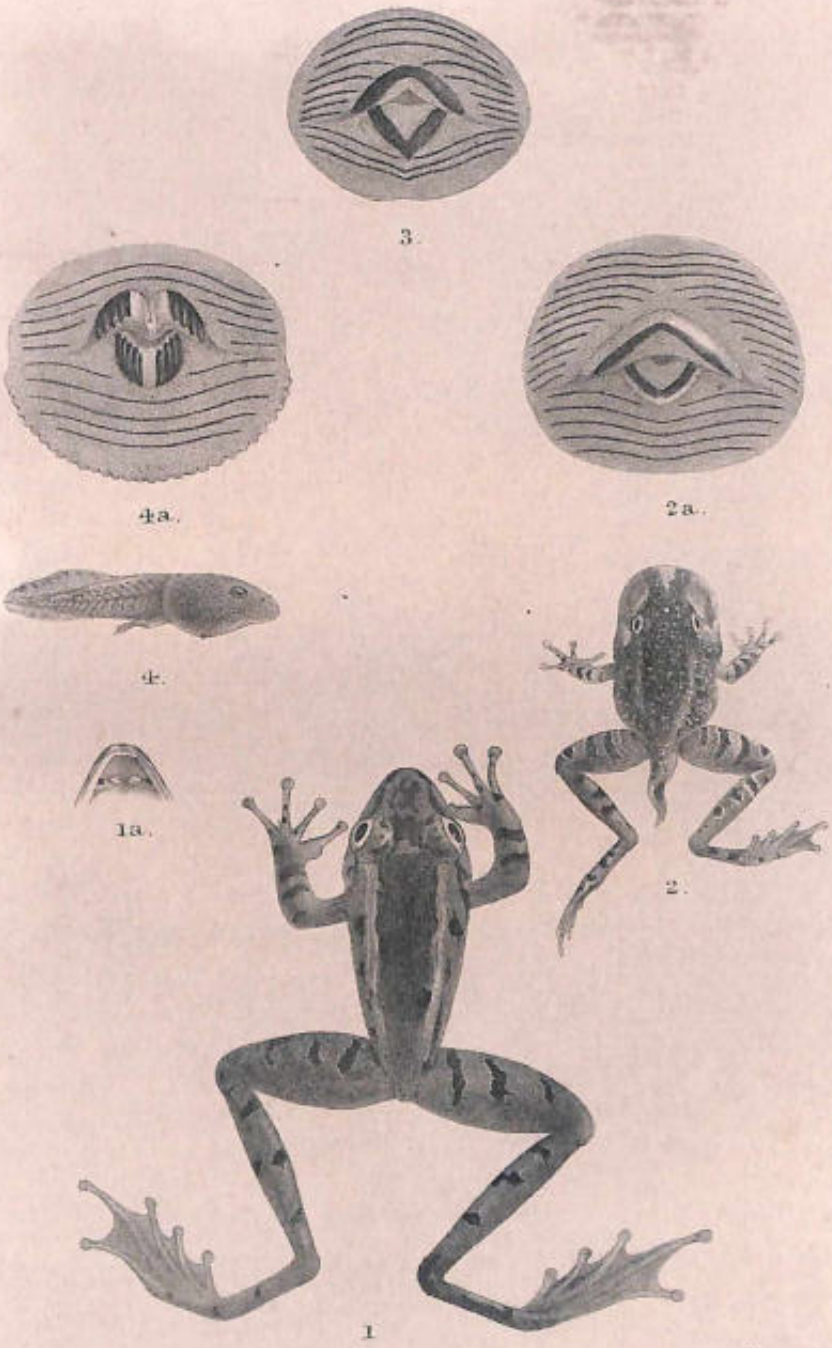


P. Mintern. del. et lith.

Mintern Bros. imp.

1. DRACO MAXIMUS.

2. DRACO MICROLEPIS.



P. Smit del. et lith. Mintern Bros. imp.

1, 2. RANA CAVITYMPANUM. 3. RANA LATOPALMATA.
4. RANA WHITEHEADI.



c.



a.



b.



a.

P. Smit. del. et lith.

Mintern Bros. imp.

RHACOPHORUS OTILOPHUS.

scales; head-scales very small; ten granular scales across middle of interorbital region, sixteen or seventeen across supraocular region; a Λ-shaped series of enlarged scales on the forehead: fourteen upper labials. The male's gular appendage once and a half the length of the head, with moderate-sized scales on its distal portion. A slight nuchal fold, but no crest. Dorsal scales equal, keeled, a little smaller than ventrals; four widely separated, enlarged, erect, keeled scales on each side of the back. The fore limb extends beyond the tip of the snout, the hind limb to the axilla. Greyish above, head speckled with black; wing-membranes black above with light longitudinal streaks, colourless beneath; throat blackish, with round white spots.

	millim.
Total length	365
Head	25
Width of head	17
Body	115
Fore limb	58
Hind limb	70
Tail	225

A single male specimen from Mt. Dulit, 2000 feet (*Hose*).

Draco microlepis. (Plate XLII. fig. 2.)

Head small; snout slightly shorter than the diameter of the orbit; nostril directed upwards, perfectly vertical; tympanum naked, smaller than the eye-opening; head-scales very small; six or seven scales across middle of interorbital region, fourteen or fifteen across supraocular region; scales on upper surface of snout subequal; fourteen upper labials. The male's gular appendage as long as the head, with moderate-sized scales. No nuchal fold or crest. Dorsal scales equal, keeled, a little smaller than ventrals; a few widely separated, enlarged, keeled scales on each side. The fore limb reaches with the whole hand beyond the tip of the snout, the hind limb to the shoulder. Pale grey-brown above, with dark spots and marblings; wing-membranes above with black marblings forming five rather ill-defined transverse bands, beneath colourless; base of gular appendage and inner surface of lateral wattles purplish red; a large black spot on each side of the gular appendage in the male.

	millim.
Total length	218
Head	15
Width of head	9
Body	63
Fore limb	38
Hind limb	47
Tail	140

Two specimens, male and female, from Merabah, North Borneo (*Everett*).

SIMOTES ANNULIFER.

Nasal divided; portion of rostral seen from above slightly shorter than its distance from the frontal; suture between the internasals slightly shorter than that between the præfrontals; frontal as broad as long, longer than its distance from the end of the snout, shorter than the parietals; a small loreal; one præ- and two postoculars; temporals 1+2; seven upper labials, third and fourth entering the eye; four lower labials in contact with the anterior chin-shields, which are longer than the posterior. Scales in 15 rows. Ventrals 153; anal entire; subcaudals 49. Brown above, with 26 black annuli on the back, enclosing large oval yellowish-brown spots; sides black-spotted, with vertical and oblique yellowish lines; head yellowish brown above, with a dark brown transverse bar across the forehead, passing through the eye, a large Λ-shaped marking from the frontal shield to the nape, and an oblique bar on the temple; labials, chin, and throat black-spotted; lower parts white, with a series of small black spots on each side.

Total length 160 millim.; tail 30.

A single young specimen from North Borneo (*Everett*).

OLIGODON EVERETTI.

Nasal divided; portion of rostral seen from above slightly shorter than its distance from the frontal; suture between the internasals shorter than that between the prefrontals; frontal longer than its distance from the end of the snout, slightly shorter than the parietals; loreal very small, longer than deep; one præ- and two postoculars; temporals 1+2; seven upper labials, third and fourth entering the eye; four lower labials in contact with the anterior chin-shields, which are longer than the posterior. Scales in 15 rows. Ventrals 154; anal entire; subcaudals 46. Slaty grey above, with three blackish-brown stripes, the middle one three scales wide and enclosing a series of small yellowish-brown rhomboidal spots; head brown above, with two chevron-shaped black bands, the anterior passing through the eyes, the posterior with the point on the frontal shield; uniform coral-red beneath, the outer ends of the ventral shields black.

Total length 370 millim.; tail 70.

A single female specimen from Mt. Kina Balu (*Everett*).

CALAMARIA BALUENSIS.

Rostral a little broader than deep, visible from above; frontal nearly twice as long as broad, not twice as broad as the supraocular, as long as the parietals; eye rather large, its diameter much greater than its distance from the mouth; one præ- and one postocular; five upper labials, third and fourth entering the eye; symphysial in contact with the anterior chin-shields; both pairs of chin-shields in contact with each other. 13 rows of scales. Ventrals 175; anal entire; subcaudals 28. Tail ending

in a point. Brown above, with small black spots; an interrupted black streak along each side of the head and neck, passing through the eye; upper lip and lower parts white; belly with three longitudinal series of small black spots; a black line along the lower surface of the tail.

Total length 340 millim.; tail 33.

A single male specimen from Mt. Kina Balu (*Everett*).

CALAMARIA EVERETTI.

Rostral broader than deep, well visible from above; frontal once and a half as long as broad, not twice as broad as the supraocular, shorter than the parietals; one præ- and one postocular; eye rather large, its diameter much greater than its distance from the mouth; five upper labials, third and fourth entering the eye; two pairs of chin-shields in contact with each other; first lower labial in contact with its fellow behind the symphysial. Scales in 13 rows. Ventrals 144; anal entire; subcaudals 23. Tail ending in a point. Coloration quite similar to that of *C. sumatrana*, Edeling. Brown above with longitudinal series of darker spots, forming two lines along each side; each scale of the outer row white in the middle, dark brown on the borders; nape dark brown, followed by a yellow collar; upper surface of head brown, spotted with darker; lower parts uniform yellowish, with a dark line along the middle of the tail.

Total length 100 millim.; tail 10.

A single young specimen from Sarawak (*Everett*).

RANA CAVITYMPANUM. (Plate XLIII. fig. 1.)

Vomerine teeth in two slightly oblique transverse groups between the choanæ; latter of moderate size. Head moderate, as long as broad; snout short, rounded, not projecting, with angular canthus rostralis and deeply concave loreal region; nostril slightly nearer the eye than the tip of the snout; interorbital space narrower than the upper eyelid; tympanum distinct, deeply sunk, three-fifths the diameter of the eye. Fingers moderate, first extending slightly beyond second; toes moderate, entirely webbed; disks well developed, about half the diameter of the tympanum; subarticular tubercles rather small; a very small, oval inner metatarsal tubercle, not quite one third the length of the inner toe. Hind limb very long, as in *R. whiteheadi*; tibia two-thirds length of head and body. Skin smooth; no glandular lateral fold. Pale grey-brown above, a broad dorsal area blackish brown, sharply defined on the sides; a dark bar between the eyes; a black streak from the lip to the shoulder, passing through the nostril and eye and above the tympanum; lips with black spots; limbs with narrow dark brown cross-bars; lower parts white. Male with an external vocal sac on each side of the throat, below the commissure of the jaws; no humeral gland; inner finger thickened at the base.

From snout to vent 45 millim.

A single male specimen from Kina Balu (*Everett*).

I am glad to be able to supplement this description of the adult with an account of the very remarkable larval characters furnished by a specimen, undoubtedly of the same species, at the close of the larval period, obtained by Mr. Everett at Bongon, N. Borneo.

The breast is covered with a large sucking-disk, free on its borders, truncate in front. The lips are much developed, not fringed, and armed with numerous series of horny teeth forming 3 uninterrupted and 8 paired rows on the upper lip, and 4 uninterrupted and 1 interrupted rows in the lower lip, disposed as shown in the figure. The horny beak is formed of an upper and a lower mandible, both of which are angular, smooth, and very finely denticulate at the edge. The larva is so far advanced that I am unable to say anything of the other larval characters. But in the important points of the structure of the mouth and ventral disk it shows the greatest resemblance to some hitherto undetermined larvæ from Bantam, Java, which I described and figured in 1882 (Cat. Batr. Ecaud. p. 89). At that time the only Frog known to inhabit Java that possessed fully webbed toes dilated into large disks, as shown by one of the larvæ, was *Rhacophorus reinwardti*; and I therefore referred them "provisionally, not without doubt," to that species. That this reserve was warranted, is shown by the discovery in Java soon after of a Frog, *Rana masonii*, Blgr. (=*jerboa*, Gthr.), agreeing in the above points with the larvæ in question, which I have now no doubt belong to it. Numerous larvæ of an allied species, *R. whiteheadi*, Blgr., at all stages of development, hence easily determinable, were collected by Mr. Everett in mountain-streams flowing into the Sarawak and Baram Rivers and at Bongon. They differ, however, from the larva above described in having both upper and lower mandible formed of two pieces, separated in the middle line by a considerable interspace; these horny pieces differ besides in being ribbed and strongly toothed. Somewhat similar larvæ, but with the lower mandible formed of a single piece, have been recently described and figured by Mocquard (Nouv. Arch. du Mus. 3, ii. 1890, p. 154, pl. xi. fig. 4) in his paper on the Reptiles and Batrachians of Kina Balu and referred by him, rightly I think, to his *Ixalus nubilus* (= *Rana natatrix*, Gthr.). Another larva with ventral disk, and agreeing very closely in the buccal characters with that of *R. jerboa* and *cavitympanum*, was obtained by M. Fea in the Kakhien hills, Upper Burma, and referred by me to *Rana latopalmata*, Blgr. (*afghana*, Gthr.). I have since found three specimens of the latter larva, from Darjeeling, in the late Mr. Day's collection. We are therefore now acquainted with five species with a ventral disk in the larval stage, and all five belong to species of the genus *Rana* in which the toes are fully webbed and the digits strongly dilated. They may be distinguished by means of the following synopsis :—

A. Beak formed of two pieces, an upper and a lower, feebly denticulate, not ribbed; lower lip not fringed.

a. Series of labial teeth $\frac{3\ \ 1\ \ 3}{1\ \ 3\ \ 1}$ ..... *R. jerboa.*

b. Series of labial teeth $\frac{5\ \ 3\ \ 5}{1\ \ 2\ \ 1}$ ..... *R. latopalmata.*

c. Series of labial teeth $\frac{8\ \ 3\ \ 8}{1\ \ 4\ \ 1}$ ..... *R. cavitympanum.*

B. Beak formed of three or four pieces, toothed, ribbed on its outer surface; lower lip with a fringe of papillæ.

a. Lower mandible formed of a single piece..... *R. natatrix.*

b. Lower mandible formed of two pieces, like the upper ..... *R. whiteheadi.*

RHACOPHORUS OTILOPHUS. (Plate XLIV.)

Vomerine teeth in two small oblique series close to the inner anterior angle of the choanæ, which are exceedingly large. Head much depressed, large, a little broader than long; supratemporal region roofed over by rugose dermo-ossification; frontoparietals rugose; a strong, spinose, bony crest above the tympanum; a spine at the angle of the jaws; snout pointed, a little longer than the diameter of the orbit; nostrils close to the tip of the snout; canthus rostralis sharp, loreal region deeply concave; forehead concave; interorbital space a little broader than the upper eyelid; tympanum nearly as large as the eye. Fingers long, with rudimentary web, the tips dilated into rather large disks; toes two-thirds webbed, disks smaller than those of fingers. The tibio-tarsal articulation reaches between the eye and the nostril. Skin of back finely, of belly and lower surface of thighs coarsely granulate; heel with a small triangular dermal appendage. Pale olive above, with dark grey spots and longitudinal streaks, much as in the *quadrilineatus*-variety of *R. leucomystax*; hind limbs with dark cross-bars, which are of an intense black and close together on the concealed surfaces of the hind limb. Male with internal vocal sacs.

From snout to vent 80 millim.

A single male specimen from Bongon, N. Borneo (*Everett*).

This is a most remarkable form, allied to *R. leucomystax* but with the cranial dermo-ossification carried considerably farther, and reproducing pretty nearly the stage reached in the genus *Bufo* by *B. typhonius*, in the genus *Hyla* by *H. lichenata*, in the genus *Nototrema* by *N. oviferum*.

I am fortunately again able to supplement the description of a new Frog with that of its larva, several specimens at all the middle and later stages of development having been collected by Mr. Everett in the same locality as the adult.

Length of body once and a half to once and two-thirds its width,

three-fifths to four-fifths the length of the tail. Nostrils nearer the end of the snout than to the eyes; latter lateral, visible from above and from below, equidistant from the spiraculum and the end of the snout or a little nearer the former; distance between the eyes twice and a half to three times that between the nostrils, and twice and one-fourth to twice and one-third the width of the mouth. Spiraculum on the left side, directed upwards and backwards, equidistant from the end of the snout and the anus. Anus opening on the right side, close to the body and above the lower edge of the tail, as in *Hyla*. Tail twice and one-third to thrice as long as deep, acutely pointed; the depth of the muscular portion about three-fifths the total depth.

Mouth as in a typical *Rana*. Beak black; sides and lower edge of the lip fringed with papillæ; upper lip with a long series of fine horny teeth, followed on each side by three series; three uninterrupted series of teeth on the lower lip.

Total length of largest specimen 80 millim.; body 29; width of body 21; length of tail 51; depth of tail 17.

EXPLANATION OF THE PLATES.

PLATE XLII.

Fig. 1. *Draco maximus*, p. 522.
Fig. 2. *Draco microlepis*, p. 523.
a. Side view of head of male.

PLATE XLIII.

Fig. 1. *Rana cavitympanum*, p. 525.
a. Vomerine teeth.
Fig. 2. Larva of *Rana cavitympanum*, p. 526.
a. Mouth. × 3.
Fig. 3. Mouth of larva of *Rana latopalmata*, p. 526. × 4.
Fig. 4. Larva of *Rana whiteheadi*, p. 526.
a. Mouth. × 5.

PLATE XLIV.

Rhacophorus otilophus, p. 527.
a. Side view of head; *b*. Vomerine teeth; *c*. Larva; *d*. Mouth. ×6.

June 20, 1893.

Sir W. H. FLOWER, K.C.B., LL.D., F.R.S., President, in the Chair.

Mr. Sclater exhibited two eggs of the Cape Coly (*Colius capensis*) laid in the Society's Gardens, and made the following remarks:—

For some time past we have had three examples of this Coly in one of the large cages in the Parrot House. As they showed a disposition to build, a basket-nest was placed in the cage, to which the birds made additions from materials supplied to them. The

result was that an open shallow nest was constructed, in which altogether nine eggs have been deposited. We believe that the birds are all females and have all laid eggs in the same nest. They have occasionally sat upon them, but not in a regular manner.

The eggs are of a dull white colour, with rather a rough texture, and without spots of any kind. Referring to Layard and Sharpe's 'Birds of South Africa,' p. 552, I find it stated that the eggs of this Coly are sometimes streaked, but those laid in the Gardens are perfectly uniform, as will be seen on inspection.

The Hon. Walter Rothschild exhibited a series of the Parrots of the genus *Cyanorhamphus*, and made the following remarks:—

In vol. xx. of the 'Catalogue of Birds in the British Museum' Count Salvadori enumerates fourteen species of this genus and mentions a fifteenth species, *C. hochstetteri* (Reisch.).

Having a very fair series of most of these birds, and finding them terribly confused in many of the larger collections, I have thought it might be interesting to exhibit examples of a rare species alive and a good series of those others of which I possess skins. I also have to describe a new form which has hitherto been confounded with *C. auriceps* (Kuhl). This form differs, it is true, in most respects very slightly from the typical *C. auriceps* of New Zealand; but in this genus the birds from the different islands are always constant forms, and therefore I feel justified in separating the Chatham Island bird, and I have much pleasure in naming it after my friend Mr. H. O. Forbes.

CYANORHAMPHUS FORBESI, sp. nov.

Similar to *C. auriceps* (Kuhl), but larger and with the crimson band in front of the yellow crown much narrower. The band of crimson in *C. auriceps* also reaches the eye, and in some specimens there is also a crimson patch behind the eye, while in my new species there is always a clear space between the crimson band and the eye.

Hab. Chatham Islands.

Types in Mus. W. Rothschild.

From the large number of specimens I have from the Auckland Islands, the Chatham Islands, and both the North and South Islands of New Zealand, I have come to the conclusion that *Cyanorhamphus aucklandicus*, Bp., and *C. rowleyi* (Buller), are only synonyms of *C. novæ zealandiæ* (Sparrm.); for the specimens from all parts vary in size so much that no two can be found entirely identical in measurements, and no constant differences in colour can be detected.

Of doubtful species there still remain *C. hochstetteri* and *C. erythrotis*, which I think Mr. Forbes was quite right in provisionally uniting under the name of *C. erythrotis*, for, except the two in the British Museum, we have as yet no authentic specimens from the Macquaries. The material from Antipodes Island, I think, is not sufficient to settle the point finally; and therefore

I consider that for the present the following species only can stand as distinct :—

1. *Cyanorhamphus ulietanus* (Gm.). Society Islands.
2. *C. erythronotus* (Kuhl). Society Islands.
3. *C. unicolor* (Vig.). Antipodes Island.
4. *C. novæ zealandiæ* (Sparrm.). New Zealand, Chathams, Auckland I.
5. *C. cooki* (G. R. Gray). Norfolk Island.
6. *C. subflavescens*, Salvad. Lord Howe Island.
7. *C. erythrotis* (Wagl.). Macquarie Is. and Antipodes I.
8. *C. saisseti* (Verr. & Des Murs). New Caledonia.
9. *C. cyanurus*, Salvad. Kermadec Islands.
10. *C. auriceps* (Kuhl). New Zealand.
11. *C. malherbei*, Souancé. South Island, New Zealand.
12. *C. forbesi*, Rothsch. Chatham Islands.

Mr. W. Bateson exhibited an abnormal foot of a calf, which had been forwarded to him for examination by the kindness of Mr. W. L. Sclater.

The specimen was a right fore foot, bearing three digits disposed almost symmetrically with regard to the axis of the limb. Of the carpus only the distal row remained, consisting of the usual two elements, a trapezoido-magnum and an unciform. External to the unciform the small rudiment, considered as representing the fifth digit, was of the usual size and proportions. The upper end of the metacarpal bone presented no peculiarity. Peripherally, however, instead of the usual two articular surfaces the metacarpal in this limb had *three* articular surfaces, all standing in the same plane as those of a normal limb. Each articular surface is well formed and has a large trochlear ridge. The central articular surface differs a little from the other two, being slightly crowded against the external one. In it also the trochlear ridge does not exactly divide the articular surface, but is rather nearer to the external side. With each of the three surfaces articulates a digit containing three phalanges of full length. Over each articulation is a pair of normal sesamoids, three pairs in all, instead of two pairs.

Each digit bears a hoof. The hoof of the middle digit is *convex* on both sides, but each of the lateral hoofs is convex on its outer side and concave on the side turned towards the hoof of the middle digit. The small accessory hoofs, the *ergots* of French writers, are normal and stand in their usual positions with regard to the limb, one being above and slightly external to the metacarpo-phalangeal articulation of each of the outer digits. The limb is almost exactly symmetrical about a line taken through the centre of the middle toe. Each of the toes had well-formed flexor and extensor tendons.

In the normal metacarpus of the Ox there is in the peripheral third a median groove of some depth, indicating the line of demarcation between the metacarpals III. and IV. It is in this

groove that the foramen for the nutrient artery is placed on the posterior surface of the limb. In the abnormal specimen there is no median groove, but on either side of the middle digit there is such a groove, indicating the lines of demarcation between the parts of the metacarpus belonging to each of the three digits. The groove between the middle and external digit is very slightly the deeper of the two, and in it is placed the foramen for the nutrient artery on the posterior surface.

The specimen was an old one and no particulars as to parentage or to the condition of the other limbs were to be had. It was mentioned that this case differed from that of the three-toed Cow described by Neville Goodman, 'Journ. Anat. and Phys.' 1868, in that there was in the present example an almost perfect symmetry about the middle axis of the foot.

The following extracts from a letter addressed to the Secretary by Mr. F. E. Blaauw, C.M.Z.S., of 'sGraveland, Hilversum, Holland, were read:—

"Last autumn I obtained a pair of *Aramides ypecaha*. I kept the birds indoors during the winter and turned them out in spring into an out-of-door aviary, in which is a small rockery that served formerly for *Hyrax capensis*. In the first days of May I observed that the male bird collected straw, hay, and bundles of grass that he uprooted with his strong bill, and brought it all to the very top of the rockery, where in a depression between the stones he made a flat nest of the said materials. As the female did not appear to take much notice of the exertions of the male, I was a little doubtful as to the result, but as the birds were extremely noisy at that time I retained some hopes. On the 16th I observed the female sitting on the nest, and on the 17th the keeper informed me that there was an egg in the nest. As the birds were very much excited and the male bird attacked furiously everybody he could reach, the number of eggs laid was not then ascertained for fear of disturbing the birds, but it was afterwards found that the number was *four*. As soon as the eggs were laid the birds began to incubate, the female mostly during the night and the male during the day, and the birds sat so loosely that the slightest thing would disturb them. If a person approached the nest or the aviary when the *male* was sitting, it would come down directly to attack the intruder. If the female happened to be on the nest she would keep motionless and wait till you turned your eyes from her, when she would vanish like a shadow. If you happened to turn your eyes on her before she had had time to get quite clear away, she would stop in the position she was in, sometimes with a leg half stretched out, and keep quite motionless till you again turned your eyes from her, when she would take care to be *quite* away before you looked round again.

"As incubation advanced the birds began to sit closer and were not so easily tempted to abandon their task, and on the 21st day of incubation the head of a young bird was seen peeping from under

the breast of its parent. Early in the morning of the 22nd day the keeper found the whole family, consisting of the two parents and four young ones, on the ground basking in the sun.

"The young birds had beautiful glossy chocolate-brown down, which became almost black on the back and lighter on the head. The legs and beak were short and jet-black.

"The little birds were wonderfully active and strong, and in the evening they all managed to get up to the nest on the stones, where they passed the night under one of the parent birds. The mother bird was very anxious about the safety of her young, and if anybody approached the aviary a sharp noise she made would quickly send them away to hide between the stones. If one kept motionless at some distance, the same note but a little softer would call them to the light again. Both parents fed the young in exactly the same way as Cranes do, bringing them ants' eggs, flies, worms, or anything they thought fit, in their bills, which the young would take from them. The little birds, now twelve days old, grow very rapidly; the legs and neck especially have lengthened considerably, so that they begin to resemble their parents in form very much.

"They also have already acquired the habit of jerking their little tails, which of course are nothing but down. The old birds, which were very noisy at all times, even while incubating, and could sing the most wonderful duets, have become perfectly silent since the young were hatched.

"The eggs were of a greyish yellow, with dark red and brown spots and lines."

Mr. Blaauw also stated that one of his female Darwin's Rheas (*Rhea darwini*) had laid ten eggs, and that the male, after sitting thirty-nine days on seven of them, had hatched three young ones.

Dr. C. J. Forsyth Major exhibited a specimen of a subfossil Lemuroid skull from Madagascar, and spoke as follows:—

Very recently I have described[1] a strange gigantic Lemuroid skull (*Megaladapis madagascariensis*, Maj.), discovered by Mr. Last in a subfossil condition, together with remains of *Æpyornis*, *Testudo grandidieri*, Vaill., *Hippopotamus*, &c., in a marsh on the south-west coast of Madagascar.

The skull exhibited on the present occasion, found by the same collector in a similar condition in the neighbourhood of Nossi-Vey (S.W. Madagascar), is in several respects not less strange, though in a very different way. Owing to its incomplete state—the whole facial portion being wanting, as well as the right occipital region and basis cranii, and the greater part of the zygomatic arches—it is not possible to enter into many details.

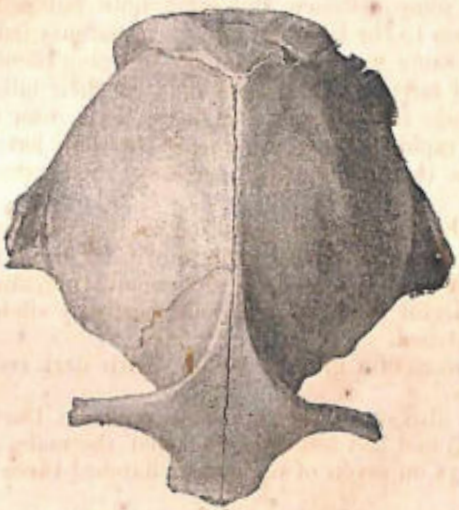
The Lemuroid nature of the specimen is at once demonstrated by the great elongation and downward bending of the postorbital frontal processes, the left one of which has preserved the suture for the orbital process of the malar, thus showing that the osseous

[1] Proc. Roy. Soc. liii. no. 326.

ring of the orbit was complete. By the fact of the orbital and temporal fossæ communicating freely under the postorbital bar, it is shown that we have not here to do with a member of the Anthropoidea.

Unusual for a Lemuroid is the very strong postorbital constriction of the frontals, and the globose form of the very broad and elevated cranial portion. As to the first character, however, we meet with it in the Tertiary *Adapis* (*A. parisiensis*, Cuv., and *A. magnus*, Filh.), and to a much less degree in the existing African *Otogale* and Malagasy *Hapalemur* [1].

Fig. 1.



Skull of fossil Lemuroid. Upper view, two-thirds nat. size.

It is with this last genus of the subfamily *Lemurinæ* that there appear to be the most affinities. And first of all in the voluminous cranial portion, the fossil being proportionally broader still than *Hapalemur simus*. This last has a very short facial portion; from the aspect of the side view it appears that in the Malagasy fossil the anterior portion of the frontals slopes down abruptly, still more so than in *Hapalemur*. This is indicative of a small facial cranium in the former too; though it may partly be a juvenile character, as the distinctness of all the sutures and the aspect of the bones show the fossil to be a somewhat young specimen, in which part of the milk-dentition may have been present.

The upper profile of *Hapal. simus*, as seen in the side view, is more rounded off posteriorly, the sloping down towards the occiput beginning anteriorly to a line which would unite the anterior

[1] F. A. Jentink, "On some rare and interesting Mammals" ('Notes from the Leyden Museum,' note vii. 1885, pl. i. fig. 1, *Hapalemur simus*, Gray).

margins of the right and left external auditory meatus across the upper surface of the skull. In the fossil this part of the superior outline of the skull is nearly horizontal, so that the anterior portion of the interparietal appears almost on the same level with the highest region of the parietals. The flattened posterior moiety of the interparietal slopes suddenly down to the occipital crest; the occiput proper is almost vertically truncated, much as in the skull of *Mycetes*. On the other hand, in *Hapalemur*, as in existing Lemuroids

Fig. 2.



Skull of fossil Lemuroid. Side view, two-thirds nat. size.

generally, the occipital crest has a more oblique direction, its inferior edge being considerably more in advance of the upper one; and the whole occiput partakes partly of this same direction.

The inferior margin of the postorbital frontal processes is cuttingly sharp in the Malagasy fossil; this is also characteristic of *Hapalemur* (both *H. simus* and *H. griseus*). In the former the frontals extend laterally somewhat farther backwards than in the latter; and the postero-superior margins of the postorbital processes continue backwards in the shape of two sharp crests, which unite at the coronal suture. No sagittal crest is visible on the median line of the parietals, which are as yet separated; but it appears obvious that this would be the case in a more aged specimen. In *Hapalemur*, even in adult specimens, no such elevated frontal crests are developed, and instead of a sagittal crest there are two temporal ridges remaining low and separated anteriorly, although near the interparietal they converge to form a feeble median crest.

The interorbital region is absolutely broader in *Hapal. simus*, and is, besides, vaulted from before backwards and from right to left, owing to underlying frontal sinuses. These last are not entirely absent in the fossil, as seen in the inferior broken portion; they extend even partly into the postorbital processes.

The olfactory fossa appears very large in the fossil, as is the case in Lemuroids generally. The anterior end of the cribriform plate is but slightly more elevated than the posterior; this is the

case in *Hapal. simus* too, and is obviously in relation to the downward bending of the facial portion.

Owing to the incomplete condition of the fossil, only a few measurements can be given :—

	millim.
Length of the fossil skull, from the occipital crest to anterior portion of frontals as far as preserved	92·7
Same distance in *Hapalemur simus*, Gray (Br. Mus. 1884/10. 20.4)	64·0
Greatest breadth of the brain-capsule between the two parieto-squamosal sutures, in the fossil	64·8
Ditto in *Hapalemur simus*	36·2

Fig. 3.



Skull of fossil Lemuroid. Lower view, two-thirds nat. size.
a, frontal sinuses ; *b*, cribriform plate.

It thus appears that, whilst the fossil skull, in its part preserved, was about one-third longer than *Hapal. simus*, the breadth of its cranial capsule was almost double that of the last [1].

The foregoing short description gives all the important characters of this interesting fossil, which in my opinion clearly assign its systematic position to be within the subfamily of *Lemurinæ*, and would besides justify the establishment of a new genus, having closer relation to *Hapalemur* than to any other members of the subfamily. I refrain, however, for the present, from giving a name to it, as there is some probability that more complete and more adult specimens may before long come to hand.

[1] The skull of *Hapal. simus* figured by Jentink (*l. c.*) is somewhat broader than the one at my disposal.

The following papers were read:—

1. A Monograph of the Butterflies of the Genus *Thysonotis*. By HAMILTON H. DRUCE, F.Z.S., and G. T. BETHUNE-BAKER, F.L.S.[1]

[Received June 20, 1893.]

(Plates XLV.–XLVII.)

THYSONOTIS.

Thysonotis, Hübn. Verz. bek. Schmett. p. 20 (1816); Feld. Wien. ent. Mon. iv. p. 244 (1860).

Danis, Fabr. Ill. Mag. vi. p. 286 (1807) (nom. præoc.); Westw. Gen. Diurn. Lep. p. 497 (1852).

Damis, Boisd. Voy. Astr., Lép. p. 67 (1832).

Plebeius, *Cupido*, *Lycæna*, Authors (part.).

Danis, Butl. Cat. Fab. Lep. p. 161 (1869) (part.).

Danis, Miskin, Ann. Queens. Mus. no. 1, p. 49 (1891).

"General characters of *Lycæna*; but with the wings generally broadly fasciated with white, not ocellated beneath, but the hind ones marked beneath with a submarginal row of black spots. Eyes hirsute. Antennæ terminated by a long, gradually formed club. Labial palpi long, first two joints clothed with scaly hairs. Fore wings with the post-costal vein three-branched; the third branch arising at a considerable distance beyond the discoidal cell; middle and lower discocellular veins very slender; upper one short, distinct. Hind wings entire, or scolloped, and with a short tail at the extremity of the first branch of the median vein. Fore legs of the female short. Basal joint of the tarsi much thicker than the rest and elongate, spined at the tips of the joints."—*Westw. loc. cit.*

"I am unable to give a satisfactory detailed character of this genus, having only been able to examine a very imperfect female in the collection of the Linnean Society, from which the accompanying figure was taken. It appears very (perhaps too) close to *Lycæna*, *D. hylas* resembling the tailed Indian species of that genus. The blue colour of the upperside is particularly brilliant, and the species inhabit the Moluccas, New Guinea and the adjacent islands."—*Westw. ibid.*

On reference to the accompanying plate it will be seen that the genus *Thysonotis* can at once be distinguished from *Lycæna* by the anastomosing of the costal nervure with the first subcostal nervule. It is also remarkable for the length of the terminal joint of the palpi of the female.

In 1779[2] Cramer described a butterfly and figured it under the name *Papilio danis*.

In 1804 Herbst referred to and refigured the same insect under

[1] Mr. G. T. Bethune-Baker is responsible for the descriptions and drawings of the genitalia of the various species, whilst I am responsible for the synonymy and notes concerning the species.—H. H. D.

[2] 1775 according to Mr. Kirby, Ent. Mo. Mag. xiv. p. 278.



W. Purkiss lith. Hanhart imp.

BUTTERFLIES OF THE GENUS THYSONOTIS.



W. Purkiss lith. Hanhart imp.

BUTTERFLIES OF THE GENUS THYSONOTIS.



W. Purkiss lith. Hanhart imp.

BUTTERFLIES OF THE GENUS THYSONOTIS.

the name *Papilio damis*. Fabricius in 1807 (Illiger's Mag. vi. p. 286) described the genus *Danis*, but did not mention his type. Westwood, in 1852, was apparently the first author to associate the Fabrician genus with Cramer's insect, but upon what grounds is not clear. But by the rules of nomenclature a generic name must not be one which has been used as a specific name, consequently *Danis* cannot stand. Now, to make matters still more complicated, Boisduval in 1832 (Voy. Ast., Lep.) uses *Damis* as a generic name, but by the same law this is inadmissible.

Westwood in 1852 characterized the genus, at the same time expressing his doubts whether it showed sufficient distinctness to allow of its separation from *Lycæna*. But why he allowed the Fabrician name to stand for the genus, when Cramer's insect had received it as a specific name some 28 years before seems inexplicable.

So far as Boisduval is concerned, I think there can be no doubt that he meant *Danis* when he wrote *Damis* on p. 67 (Voy. Astr., Lép.), as on p. 69 he writes *E. damis*, Godt., and *P. damis*, Cr., both of which should be spelt *danis*.

The question now is what generic name should be used, as it is not right that Cramer's name should be only a synonym when his insect was described for so long a time before Boisduval's.

The next name to deal with is *Thysonotis*, proposed by Hübner in 1816, which has been used by Semper and others for these insects; and bad as we think is the practice of doing away with well-known generic names for others which may be older but which their authors have employed without characterizing, in this case we can see no help for it, as it affects the specific name of the type of the genus.

Dr. Felder at one time (1859) used *Danis* when describing an insect of the group, afterwards (in 1860) *Thysonotis*, and then seems to have considered *Lycæna* sufficient.

In a note by Mr. W. Doherty published by Mr. de Nicéville (Butt. India, iii. p. 261), he speaks of an *Arhopala* mimicking the *danis* group of *Cyaniris*, but as the type of that genus has the costal nervure of the fore wing free, and as after examining a large number of the group we have not found one which at all approaches it in that respect, we do not think, in spite of Mr. de Nicéville's remarks about *C. transpectus*, Moore (Butt. India, iii. p. 92), that they can be placed together under the same generic name. It is evident such a course would alter the synonymy considerably, and we venture to think uselessly, as we have here a group of Butterflies which, although they cannot be perhaps structurally defined, present in their markings an easily recognized division in the family.

We have divided the genus into 5 divisions as follows, a short account of which is given under their respective headings:—

A. The *danis* group.
B. The *wallacei* group.
C. The *schaeffera* group.
D. The *taygetus* group.
E. The *cyanea* group.

The Butterflies of this genus are entirely,—with the exception of *T. schaeffera*, which occurs in the Oriental region,—confined to the Indo-Australian region, and the genus is apparently most highly developed in New Guinea and the adjacent islands and the northern parts of Queensland, and is inclined to diminish both in size and in brilliancy more towards the Western limits of its range than towards the Eastern.

The *danis* and *wallacei* groups are found only in what may be called the headquarters, the *schaeffera* group occurring on the Eastern and Western limits only; the *taygetus* group occupies the whole range of islands and N. Australia; whilst the *cyanea* group, again, is best represented at headquarters.

The following Table is intended to show the various localities from which each species has been recorded:—

	Philippine Is.	Palawan.	Borneo.	Celebes.	Sula Is.	Batchian.	Gilolo.	Ternate.	Waigiou.	Salwatti.	Mysol.	Ceram.	Amboina.	Key Is.	Aru Is.	Tenimber Is.	Wetter.	New Guinea.	Dorey.	Louisiade Archipelago.	New Ireland.	Solomon Is.	New Caledonia.	Queensland.	N. Australia.	Fiji Is.
THYSONOTIS.																										
A. serapis																								*		
danis												*	*											*?		
—, var. karpaia												*														
syrius																								*		
apollonius									*		*				*			*								
—, var. supous															*											
regina																				*						
ribbei																		*								
philostratus						*	*	*	*																	
B. wallacei									*		*															
melimnos					*									*				*								
perpheres								*											*							
C. schaeffera	*	*	*			*		*																		
caledonica																							*			
cepheis																						*				
D. taygetus																								*	*	*?
macleayi																								*		
hymetus						*	*					*	*					*								
korion								*						*												
brownii																					*					
cœlius					*	*					*				*			*	*							
eudocia						*																				
piepersii				*																						
kruera																						*				
E. cyanea												*	*													
epicoritus									*									*								
arinia																										
smaragdus																	*							*		
sperchius																		*								
pindus						*		*										*								
chromia																						*				
illustris														*										*		
miraculum									*																	

A. *The* DANIS *group.*

In this group the males are more or less metallic blue, and both sexes have a white band common to both wings. The species are best distinguished by the presence or otherwise of the metallic blue on the upperside of the females. In *T. serapis* this character seems at its best, as the hind wing is suffused all over, and the base of the fore wing very strongly, with metallic green scales. *T. danis* and var. *karpaia* have the metallic scales along the costal margin only, whilst *T. philostratus*, *T. apollonius*, and *T. regina* are absolutely without any metallic scales on the upperside.

T. syrius and *T. ribbei* we have not seen, but from Mr. Miskin's note concerning his species the female has apparently some blue on the upperside.

The females of all the species of this group have the outer marginal band of the hind wings beneath broader, and the blue more extensive, than the males.

THYSONOTIS SERAPIS. (Plate XLV. figs. 1, 2.)

Danis serapis, Miskin, Ann. Queensl. Mus. no 1, p. 49 (1891).

Hab. Cardwell, Cairns, Queensland (*Miskin*); Herbert River, W. Queensland (*Mus. Staud.*); N. Queensland (*Mus. D.*).

This is perhaps the easiest species of the group to distinguish, as it is the only one in which the hind wings of the female are suffused with metallic scales. We have in our collection a number of specimens collected by Mr. Gervas Mathew, R.N., in Queensland, but the precise locality is not noted. They vary considerably in size and also somewhat in the width of the metallic fascia on the underside of the hind wings. The extent of blue and also of white on the upperside of the male seems to be quite constant.

THYSONOTIS DANIS. (Plate XLVII. figs. 1, 1*a*, 1*b*.)

Papilio danis, Cr. Pap. Exot. i. pl. 70. ff. E, F (1779).

Papilio damis, Herbst, Naturs. Schmett. xi. t. 321. ff. 10, 11 (1804).

Erycina danis, Godart, Enc. Méth. ix. p. 577 (1819).

Cupido damis, Pagens. Lep. Fauna Amb. (1884); Schmett. Amb. p. 10 (1888).

Plebeius damis, Ribbe, Iris, ii. p. 240 (1889).

Damis sebæ, Boisd. Voy. Astr., Lép. p. 68 (1832); Guér. Voy. Coquill. p. 275, Atlas, ii. t. 18. f. 12; Blanchard in Hombron et Jacquinot, Voy. Pôle Sud, Lépid. pl. 3. ff. 1, 2 (1853).

Danis sebæ, Westw. Gen. D. Lep. p. 497, pl. 77. f. 4 (1852).

Danis danis, Semper, J. Mus. Godeff. xiv. p. 154 (1878).

Danis sebæ, Miskin, Ann. Queensl. Mus. no. 1, p. 49 (1891).

Hab. Amboina; Ceram; Cardwell to C. York.

Although Cramer gives "Indes Occidentales" as the locality of this well-known species, there can be no doubt from an examination of his figure that he delineates an Amboinese example. My authority for giving Ceram is a pair (♂ ♀) in Messrs.

Godman and Salvin's collection labelled "Ceram, Wallace," which are undoubtedly true *danis*.

We are obliged to place the Australian specimens under this name as the males are identical, but although there are a considerable number of specimens in Messrs. Godman and Salvin's possession from Somerset, C. York, and also in the British Museum and in our own collection, unfortunately there is not a single female amongst them; and, so far as we have been able to ascertain, those writers who have remarked on this species have not stated whether the female possesses any metallic blue above or not.

From a note of Mr. Miskin's (*loc. cit.*) under *D.* (=*T.*) *serapis*, "specimens from Cape York and New Guinea of *D. sebæ* I have found to be tolerably stable in their appearance," one is inclined to think there is not, as no New Guinea female specimens have blue above, but, on the other hand, New Guinea males have considerably larger white disks to the fore wing. This is a point which requires looking further into when more material is available.

Dr. Haase has described and figured some of the scales of this insect in his paper on the "Scent-apparatus of Indo-Australian Butterflies" (Iris, i. pp. 106, 317, pl. iii. f. 12, 1886, 1888).

Herr Semper writes (*loc. cit.*):—"The females from the Aru Is. and Australia have no blue on the upperside such as the illustrations of Cramer's and the examples from Ceram show." If this is the case, the Australian insect will probably come under the species named *T. apollonius* by Dr. Felder.

Guérin-Méneville (Voy. Coq.), in describing the male, writes:—"Le mâle est plus petit (45 mill. d'enverg.), entièrement noir en dessus, avec les ailes antérieures arrondies au bout;" which is of course incorrect.

Genitalia. Clasps longish, moderately slender, fork arising from near base, rather short. Tegumen fairly developed, of *Lycæna* shape, but with saddle-backed hood reduced into a mere ridge and thrown back (*i. e.* towards head of insect); hooks very long and slender.

Penis most unusually stout, but not long; apical joint having a sort of hinged cover at top apparently capable of closing over the lower portion; the apex or tip probably has the power of being withdrawn into the main tube of organ. (Plate XLVII. figs. 1, 1 *a*.)

The above description is taken from a male obtained from C. York.

Var. KARPAIA, nov. (Plate XLV. figs. 3, 4.)

♂. Upperside allied to *T. danis*, but rather lighter blue; fore wing with the white disk larger and more distinct; hind wing with the white considerably broader and with the blue extending farther towards the anal angle. Underside as in *T. danis*, but with the outer marginal border of hind wing which contains the blue lunules much narrower, while the lunules are the same size, consequently the white area is much enlarged.

♀. Upperside as in *T. danis*, but the black borders narrower and more evenly defined. Underside as in ♂.

Head, thorax, abdomen, and legs as in *T. danis*.

Expanse, ♂ $1\frac{7}{10}$–2 inches, ♀ 2 inches.

Hab. Ceram.

This form occurs only in Ceram and does not appear to vary. The types are in Messrs. Godman and Salvin's collection, and specimens are also contained in the British Museum.

The cilia of both sexes are alternately black and white, but not so markedly as in *T. danis* (typical).

THYSONOTIS SYRIUS.

Danis syrius, Misk. P. L. Soc. N. S. W. ser. 2, v. p. 34 (1890) [1]; Ann. Queensl. Mus. no. 1, p. 49 (1891) [2].

Hab. N. Queensland [1]; C. York [2].

We have not seen this species, the male of which is described as light greyish blue above, with the fringes of both wings alternately black and white below.

Mr. Miskin notes: "This is near to *sebæ* and the markings are similar to that species, but the decidedly different tint of blue, the absence of metallic sheen, and the somewhat larger size seem to distinguish it." He says of the female, "As in male, except that the blue is much less pronounced, the upperside being almost black."

It is notable as being the only species which has non-metallic blue.

THYSONOTIS APOLLONIUS. (Plates XLV. figs. 5, 6, XLVII. figs. 2, 2*a*.)

Lycæna apollonius, Feld. Reise Nov., Lep. ii. p. 265, t. 33. f. 3 (1865).

Plebeius danis, Ribbe, Iris, i. p. 84, 1885 (nec Cramer).

Cupido danis, Oberthür, Mus. Gen. xv. p. 522 (1880) (nec Cramer); Kirsch, Beitr. Lep.-Faun. von Neu-Guinea, p. 126 (1877) (nec Cramer).

♂. Allied to *T. danis*, ♂. Generally larger. Upperside somewhat lighter blue with less sheen; the white disk of fore wing larger and more clearly defined and the outer-marginal black border gradually widening towards the anal angle. Hind wing—outer half black, covered with greyish-blue scales, thickest towards the apex. Underside as in *T. danis*, but the black borders considerably wider, more especially in the hind wing, in which the white band becomes straighter, much narrower, and is placed before the middle. Cilia alternately black and white on both surfaces.

Head, thorax, abdomen, and legs as in *T. danis*.

Expanse, ♂ $1\frac{1}{2}$–$2\frac{1}{6}$ inches, ♀ $1\frac{2}{3}$–$2\frac{1}{3}$ inches.

Hab. Central New Guinea (*D'Albertis*); Islands in N. Geelvink Bay (*Kirsch*); Port Moresby (*Goldie*) (*Mus. G. & S.*); New Guinea (*Mus. Staud.*); Waigiou, Soron (*Oberthür*); Jobi (*Kirsch*); Mysol (*Wallace*); Waigiou (*Platen*); Aru (*Wallace*).

Female specimens from Mysol and one in Dr. Staudinger's collection from Waigiou agree best with Dr. Felder's figure, but a female in Messrs. Godman and Salvin's possession has a rather less extensive blue band on hind wing beneath. These gentlemen also possess a female from Aru Islands, which does not differ from the New Guinea female except in its smaller size ($1\frac{2}{5}$ inch).

This is a somewhat puzzling species on account of the exceptional difference in the widths of the blue bands on underside of hind wings of the two sexes and also the varying width of this band in the female, no two specimens, even from the same locality, being identical.

Judging from the arrangement in the British Museum, Mr. Butler appears to think that Boisduval's name (*sebæ*) should be used for the Aru Islands form, but I am unable to distinguish it from *T. apollonius* and think it is quite evident from the context of Boisduval's description that he was simply redescribing Cramer's insect.

Probably the specimen Godart described from Rawak (Encycl. Méth. p. 578) was a representative of *T. apollonius*.

Genitalia very closely allied to those of *T. danis*, but hooks shorter. Penis with hinged cover longer than lower portion. (Plate XLVII. figs. 2, 2*a*.)

The drawing is from a New Guinea example.

Var. SUPOUS, nov. (Plate XLV. fig. 7.)

"*Lycæna danis*, Cr., var. *supous*, Ribbe," Staud. MS.

Hab. Wammo Dobbo, Aru Is. (*C. Ribbe*) (*Mus. Staud.*).

Dr. Staudinger has sent us a female with the above MS. name, which, in the absence of more material and without seeing the male, we prefer to treat as a variety. On the upperside it is quite typical, but beneath it differs from Dr. Felder's figure in the hind wing having a somewhat wider white band and considerably less blue.

THYSONOTIS REGINA.

Thysonotis regina, Kirby, Ann. Mag. Nat. Hist. (6) xvi. p. 163 (1889).

Hab. Normanby I., Louisiade Archipelago.

This species may be distinguished from the preceding principally by having the disks of the fore wing in the male almost completely covered with blue. The only specimens we have seen are the types in the British Museum, which do not vary. They were collected by Mr. Basil Thomson in 1888, and are the most easterly examples of this group at present known.

Mr. Kirby (*loc. cit.* p. 164) writes of this insect: "Size of *T. sebæ*, West., but the male more resembles *T. danis*, Cr.:" but Westwood in his description clearly only dealt with Cramer's species, so that the meaning of this remark is not quite apparent.

THYSONOTIS RIBBEI.

Plebeius ribbei, Rober, Iris, i. p. 52, pl. iv. f. 2, ♂ (1886)[1].

Hab. N.W. New Guinea, Sekar.

This species seems to differ from all others by having a narrow metallic line between the usual broad fascia and the margin on the hind wing below. It is known to us only from the figure.

The female is undescribed.

THYSONOTIS PHILOSTRATUS. (Plates XLV. fig. 8, XLVII. figs. 3, 3 *a*.)

Lycæna philostratus, Feld. Reise Nov., Lep. ii. p. 264, t. 33. ff. 1, 2 (1865).

Cupido philostratus, Kirby, Syst. Cat. p. 346 (1871); Oberthür, Ann. Mus. Genova, xv. p. 522 (1880).

♂. Upperside much like *T. apollonius* ♂, but of a more violaceous shade of blue.

Underside as ♀, but white central band, as is usual, rather wider.

Hab. Gilolo (*Felder*) (*Platen in Mus. Staud.*) (*Wallace in Mus. G. & S.*); Batchian (*Platen*); Waigiou (*Mus. G. & S.*); Batchian (*Doherty*) (*Mus. D.*); Ternate (*Oberthür*).

This is an easily distinguished species and does not appear to vary except in size—a small female from Batchian in Messrs. Godman and Salvin's collection measuring only $1\frac{3}{5}$ inches, a large one from Waigiou 2 inches.

Genitalia. Clasps somewhat bottle-shaped, but rounded at the base, and the neck (continuing the simile) thick, the apices being bluntly toothed. Tegumen with sides fully developed; hooks of moderate length and rather slender.

Penis decidedly short, very stout, similar in shape to *T. apollonius*. (Plate XLVII. figs. 3, 3 *a*.)

B. *The* WALLACEI *group*.

This is a small group which contains insects of somewhat less robust appearance than the preceding and which have the cilia of both sexes pure white, not alternately black and white as in *danis* and allies.

Unfortunately very little is known of them, as very few are contained in collections. They are certainly some of the most beautiful of the genus.

THYSONOTIS WALLACEI.

Lycæna wallacei, Feld. Reise Nov., Lep. ii. p. 265, ff. 8–10 (1865)[1].

Cupido wallacei, Kirsch, Beitr. Lep.-Faun. von Neu-Guinea, p. 126 (1877)[2].

Hab. Waigiou[1]; Mysol (*Wallace*) (*Mus. G. & S.*); N. Guinea, Ansus, Kordo, Rubi[2].

The specimens from Mysol are rather smaller than Dr. Felder's figures, and the male has rather less white on the disks.

Dr. Staudinger possesses a male from Mysol, formerly in the Atkinson collection, in which the white on the disks has entirely disappeared.

THYSONOTIS MELIMNOS, sp. n. (Plate XLVI. fig. 2.)

♀. Allied to *T. wallacei*, Feld. Rather larger. Upperside—fore wing with the apex of the discal white band not produced towards the outer margin as in *T. wallacei*. Hind wing with the basal white area wider and more evenly defined. Cilia of both wings pure white.

Underside—fore wing with the black outer marginal border and the metallic blue marginal line extending right down to the inner margin. Hind wing with the white band broader and the blue marginal band gradually narrowing towards each extremity.

Head, thorax, abdomen, and legs as in *T. wallacei*.

Expanse $1\frac{9}{10}$ inch.

Hab. Dutch New Guinea, Jobi I. (*A. B. Meyer*) (*Mus. Staudinger*).

An interesting species, which will, we think, prove quite distinct from *T. wallacei*. The male is unknown and the type is contained in Dr. Staudinger's collection.

THYSONOTIS PERPHERES, sp. n. (Plate XLV. figs. 9, 10.)

♂. Allied to *T. wallacei*, Feld. Upperside considerably darker blue, no white band across the hind wing, which has rather more black at the anal angle. Cilia of fore wing white, of hind wing white spotted with black. Underside much more metallic than in *T. wallacei*, that on fore wing set farther inwards at the apex; black outer-marginal border containing metallic lunules for more than half the wing, consequently the white band is very narrow.

♀. Upperside with white band as in *T. wallacei* ♀, but much narrower and very indistinct; cilia of both wings pure white.

Underside as ♂.

Antennæ black, apparently tipped with white.

Head, thorax, and abdomen as in *T. wallacei*.

Expanse, ♂ ♀, $1\frac{9}{10}$ inch.

Hab. Dorey, N. Guinea (*Hew. Coll. B. M.*).

The only specimens we have seen of this lovely insect are the pair from which the figures are taken, and which were placed by Hewitson under the name *apollonius*.

C. *The* SCHAEFFERA *group.*

This group contains females which have a whitish discal streak on the fore wing only, the hind wing being black.

There are three easily recognized species: *T. schaeffera* has a ♂ with the disk only of the fore wing bluish; *T. caledonica* both wings rich dark purple-blue, with black borders and dark gold beneath; *T. cepheis* lighter blue, with narrower borders and metallic green below.

THYSONOTIS SCHAEFFERA. (Plate XLVII. figs. 4, 4 *a*.)

Lycæna schaeffera, Esch. Kotzeb. Reise, iii. p. 216, t. 5. f. 25, *a*, *b* (1821).

Cupido schæffera, Druce, P. Z. S. 1873, p. 348[2].

Cupido schaeffera, Oberthür, Ann. Mus. Genova, xv. p. 524 (1880)[4].

Thysonotis schaeffera, G. Semper, Reise Phil., Rhop. p. 167, t. xxxii. ff. 1–3 (1889)[1].

Lycæna schaeffera, Staud. Iris, ii. p. 94 (1889)[3].

Danis absyrtus, Feld. Wien. ent. Mon. iii. p. 270 (1859).

Hab. Philippine Is.—Luzon, Bohol, Camotes and S.W. Mindanao[1]; Borneo[2]; Palawan[3]; Ternate[4]; Batchian (*Doherty*). (*Mus. D.*); Taganac Is. (*Mus. D.*).

A well-known species which appears to be very common in the Philippine Is., and, so far as we are aware, does not show any appreciable variation.

Genitalia. Somewhat allied to *T. danis* and *T. apollonius*, but front apex of tegumen more produced and hooks stouter. Penis about a third as stout and longer, with the hinged cover, which is produced very much beyond the lower apex and is upturned at the extremity. Taken from a specimen from the Philippine Islands. (Plate XLVII. figs. 4, 4 *a*.)

THYSONOTIS CALEDONICA. (Plate XLVI. fig. 1.)

Lycæna caledonica, Feld. Reise Nov., Lep. ii. p. 267, t. 33. f. 7, ♀ (1865).

Thysonotis caledonica, H. H. Druce, P. Z. S. 1892, p. 441.

♂. Upperside dark purple-blue, with the costal margin of fore wing very narrowly and the outer margin narrowly black. Hind wing with the anal and outer margins black, widest at the anal angle and gradually decreasing towards the apex; costal margin black near the base, whitish before the apex.

Underside as ♀.

Hab. New Caledonia (*Mus. D. & B. M.*).

As I have before pointed out (P. Z. S. 1891, p. 365), Dr. Felder's figure does not give an adequate idea of the brilliancy of this insect. He described the female only and remarked that it was a local form of *L. schæffera*.

M. Kirsch (Beitr. Lep.-Faun. von Neu-Guinea, p. 126) records this species from Jobi I., but we think he has probably confounded it with some other.

THYSONOTIS CEPHEIS.

Thysonotis cepheis, H. H. Druce, P. Z. S. 1891, pl. xxxii. ff. 1, 2.

Hab. Guadalcanar I., Solomon Is.

D. *The* TAYGETUS *group.*

The insects included in this group are somewhat more slender, and have females with a white band common to both wings, with,

so far as is at present known, one exception, *T. kruera*, which has a blue female. A slight difference occurs in the venation of the fore wing, the fourth subcostal nervule terminating just before the apex, not at the apex as in the *danis* group.

THYSONOTIS TAYGETUS. (Plate XLVII. figs. 5, 5 *a*, 5 *b*.)

Lycæna taygetus, Felder, Reise Nov., Lep. ii. p. 266, t. 33. ff. 19–21 (1865).

Cupido taygetus, Kirby, Cat. Diur. Lep. p. 347 (1871); Semper, Mus. Godef., Lep. xiv. p. 155 (1878).

Danis taygetus, Miskin, Ann. Queensl. Mus. no. 1, p. 50 (1891).

Danis salamandri, Macleay, P. Ent. Soc. N. S. W. p. 54 (1866).

Hab. Somerset, C. York; Rockhampton; C. Bowen; Cooktown; Port Denison; Moreton Bay; Brisbane; Sydney. Fiji Is. (*Felder*).

This is a common insect in Queensland and is well known to vary considerably—some males having the hind wings almost entirely blue and some females being entirely without the metallic blue scales near the anal angle of the hind wings.

D. salamandri, Macleay, as has already been pointed out by Mr. Miskin and others, undoubtedly equals this species. Macleay writes:—"This beautiful little species is scarcely half the size of *D. sebæ*, and may be readily distinguished from it by its scarcely having any black on the upper surface, while on the lower there is a distinct gap between the black anterior and exterior margins of the upper wings. Cape York. Presented to the Museum by Mr. Moore of H.M.S. 'Salamander.'"

Dr. Felder has recorded this species from the Fiji Is., but amongst the large numbers of Lycanidæ we have examined from those islands we have not seen a single specimen and are inclined to think it is incorrect.

Genitalia. Clasps unusually broad, reminding somewhat of a flitch of bacon with the top extremity produced upwards into a hooked tip, the apex of which is pointed and has three distinct teeth; fork short, stout, with the division very short indeed.

Tegumen: arms broadly developed, the saddle-hood reduced into insignificance, with hooks short and stout and terminating in a sharp curved point. Penis very large and stout, though not long, somewhat barrel-shaped and flatter on the lower margin, end joint or tip with the lower portion produced into a long sharp spout (as of a jug) and without the hinged cover. (Plate XLVII. figs. 5, 5 *a*.)

THYSONOTIS MACLEAYI.

Danis macleayi, Semper, Mus. Godef., Lep. xiv. p. 155 (1878)[1]; Miskin, Ann. Queensl. Mus. no. 1, p. 51 (1891).

Hab. C. York[1]; Somerset, C. York (*D'Albertis*) (*Mus. G. & S.*).

Herr Semper describes this as differing slightly (from *taygetus*) in the spotted fringes, also in the female by a projecting tooth in the white disk in the fore wing and the very indistinct blue dust

on the bases of the wings; and the male as being of a much less intense blue.

The only specimen we have seen is a male in Messrs. Godman and Salvin's collection, which agrees with this description. The blue is certainly paler and of a more lavender shade; and the cilia of both wings pure white, spotted with brown at the extremity of each nervule.

It is difficult to say whether this species is distinct from *T. taygetus*, and this is a point which can only be satisfactorily decided by some entomologist in its native habitat. Mr. Miskin seems to be unacquainted with it.

THYSONOTIS HYMETUS.

Thysonotis hymetus, Feld. Sitzb. Ak. Wiss. Wien, math.-nat. Cl. xl. p. 459 (1860).

Lycæna hymetus, Feld. Reise Nov., Lep. ii. p. 266, t. 33. ff. 22–24 (1865).

Cupido hymetus, Kirby, Cat. Diur. Lep. p. 347 (1871).

Plebeius hymetus, Ribbe, Iris, i. p. 205 (1887); ii. p. 250 (1889) [1].

Cupido hymetus, Pagens. Lep.-Fauna Amboina, p. 44 (1884).

Cupido hymetus, Oberthür, Ann. Mus. Genova, xv. p. 523 (1880) [2].

Hab. Amboina; Ceram [1]; Batchian; Gilolo (*Wallace*) (*Mus. G. & S.*, ♂). Soran, New Guinea [2].

The single male in Messrs. Godman and Salvin's collection is considerably smaller than Felder's figure, but the female agrees exactly.

Dr. Staudinger possesses a male labelled "Celebes" with a MS. name, "*Danis ceramica*, Bd.," attached, which is undoubtedly *T. hymetus* and is probably incorrectly localized.

THYSONOTIS KORION, sp. n. (Plate XLVI. fig. 3.)

♂. Allied to *T. hymetus*. Upperside violaceous blue, narrowly black-bordered; cilia of both wings distinctly alternately black and white spotted. Underside with the blue costal streak of fore wing extending evenly almost to the apex. Hind wing with the outer marginal black border more regularly defined inwardly and the blue marginal spots more quadrate. Cilia as on upperside.

Head, thorax, abdomen, and legs as in *T. hymetus*.

Expanse 1⅛ inch.

Hab. Kei Is. (*Semper*) (*Mus. Staudinger*).

Distinguished by the broad blue costal streak on underside of fore wing and by the spotted cilia.

THYSONOTIS BROWNII, sp. n. (Plate XLVI. fig. 8.)

♂. Upperside dull violaceous blue, costal and outer margins of fore wing very narrowly blackish brown; of hind wing, apex blackish brown, increasing gradually towards the anal angle, where it is broadest. Underside most like that of *T. hymetus*, but with much less blue at the bases and with the black border to outer

margin of hind wings inwardly more evenly defined and the marginal blue lunules much less distinct; a broken metallic blue line running along the black outer marginal border of fore wing from apex to outer angle.

Head, thorax, and abdomen blackish brown. Antennæ black above, white-spotted beneath.

Expanse $1\frac{1}{5}$ inch.

Hab. New Ireland (*Brown*) (*Mus. G. & S.*).

The type specimen in Messrs. Godman and Salvin's collection is the only one we have seen. It is distinguished from all others by the blue line on underside of fore wing.

THYSONOTIS CŒLIUS.

Thysonotis cœlius, Feld. Wien. ent. Mon. iv. p. 245 (1860)[1].

Lycæna cœlius, Feld. Reise Nov., Lep. ii. p. 265, t. 33. ff. 11, 12 (1865).

Cupido cœlius, Kirby, Cat. Diur. Lep. p. 347 (1871); Oberthür. Ann. Mus. Genova, xv. p. 523 (1880)[2]; Kirsch, Beitr. Lep.-Faun. von Neu-Guinea, p. 127 (1877).

Hab. Aru Is.[1]; Dorey; Port Moresby, New Guinea; Sula Is. (*Wallace*) (*Mus. G. & S.*); Gilolo[2]; Mysol (*B. M.*); Kaiser Wilhelm's Land, New Guinea (*Eichorn*) (*Mus. Staud.*).

We have not seen the female of this species, but specimens have been received by M. Oberthür from Gilolo.

THYSONOTIS EUDOCIA, sp. n. (Plate XLVI. fig. 4.)

♂. Allied to *T. cœlius*. Upperside duller blue; fore wing with the outer margin rather more broadly bordered with brown; hind wing with the costal margin greyish brown, not white as in *T. cœlius*. The border to the outer margin and anal angle twice as broad. Underside with all the borders, especially that on the costa of fore wing, considerably broader and the blue metallic streaks and lunules very much decreased. A distinct light yellow streak stretching along the costal nervure at the base of the fore wing.

Head, thorax, abdomen, and legs as in *T. cœlius*. Antennæ black above, spotted with white below. Cilia of both surfaces brown.

Expanse $1\frac{3}{10}$—$1\frac{2}{5}$ inch.

Hab. Batchian (*Wallace, Mus. G. & S.*); (*Platen, Mus. Staudinger*); (*Doherty, Mus. Druce*, type).

Although there is before us a good series of this species there is not a single female amongst them. We have compared it to *T. cœlius*, but it is perhaps nearer to the next species, *T. piepersii*, Sn., as possessing the yellow basal streak on underside of fore wing. Its position is intermediate between the two.

THYSONOTIS PIEPERSII. (Plate XLVI. fig. 9.)

Cupido piepersii, Snellen, Tijds. Entom. xxi. p. 16, pl. 1. f. 3 (1878).

♀. Upperside dull blackish brown, with an indistinctly defined

white band common to both wings. Underside as in male, but with the yellowish basal streak on the costal margin more prominent. Cilia of both surfaces brown.

Hab. Celebes: Minahassa (*Platen, Mus. Staud.*); Tongubu (*Mus. G. & S.*); S. Celebes (*W. Doherty, Mus. D.*).

The male of this species is well figured by Herr Snellen, and the figure here given of the female is from a specimen in Dr. Staudinger's collection.

Mr. W. Doherty obtained a number of this insect in S. Celebes in August and September.

The white disks below are often more or less covered with light sulphur-yellow.

THYSONOTIS KRUERA.

Thysonotis kruera, H. H. Druce, P. Z. S. 1891, p. 364, pl. xxxi. ff. 16, 17.

Hab. Solomon Is.

So far as we know this is the only species of the group which has a blue female.

The type specimens are the only ones we have seen.

E. *The* CYANEA *group.*

The insects I have placed in this group may be recognized by the short linear tail to the lower median nervule of hind wings. There are several easily distinguished forms.

THYSONOTIS CYANEA. (Plate XLVII. fig. 6.)

Papilio cyanea, Cram. Pap. Ex. i. t. 76, C, D (1779).

Papilio cyanus, Fabr. Spec. Ins. ii. p. 116 (1781); Herbst, Pap. tab. 297.

Polyomm. cyanus, Godt. Enc. Méth. ix. p. 642 (1823).

Danis cyanea, Butl. B. M. Cat. Fabr. Lep. p. 162 (1869).

Cupido cyanea, Semper, Mus. Godeff., Lep. xiv. p. 155 (1878).

Plebeius cyanea, Ribbe, Iris, ii. p. 250 (1889)[1].

Cupido cyanea, Pagens. Schmett. Amb. p. 10 (1888); Oberthür, Ann. Mus. Genova, xv. p. 524 (1880).

Hab. Amboina (*Doherty, Mus. D.*); Ceram[1].

We possess a number of specimens from Amboina which do not vary and which agree well with Cramer's figures and whence his type was probably obtained. The locality he gives is "Indes Occidentales." His figure shows two tails to the hind wings, which is of course incorrect, but it is in other respects a good one.

As has been already pointed out by Herr Semper (Mus. Godef. xiv. p. 155), this form shows considerable differences from its Australian representative which has been described under the name *Cupido arinia* by M. C. Oberthür: in the male by the black band on the hind wing below being very much narrower and consequently allowing a much greater extent of white, and in the female by the

black borders being much narrower on both surfaces and also by having less metallic blue at the bases of the wings above. (Plate XLVII. fig. 6, penis.)

THYSONOTIS EPICORITUS. (Plate XLVI. fig. 10.)

Damis epicoritus, Boisd. Voy. Astr., Lep. p. 67 (1832).

Hab. New Guinea; Port Moresby (*Goldie*), Waigiou (*Wallace, Mus. G. & S.*), (*Mus. Staud.*).

This insect has apparently never been recognized since it was described by Boisduval. Messrs. Kirby and Miskin in their Catalogues place it as a synonym of *T. cyanea*, Cr., but a reference to the figure here given, which is taken from a specimen in Messrs. Godman and Salvin's collection from Port Moresby, obtained by Goldie, will at once show that it presents considerable differences from that species. The female is unknown.

THYSONOTIS ARINIA. (Plates XLVI. figs. 6, 7; XLVII. figs. 7, 7*a*.)

Cupida arinia, Oberth. Ann. Mus. Gen. xii. p. 465 (1878), xv. p. 523 (1880).

? *Damis albastola*, Lucas, T. P., P. R. Soc. Queensl. p. 156, ff. 3, 4 (1889).

Hab. Queensland, N. Australia.

Through the kindness of M. C. Oberthür I have been able to examine the type of this species, which is from Queensland.

The figure of the male here given is from a specimen in our own collection from N. Australia, which agrees exactly with the type, and that of the female is one of several received with it. I place Mr. Lucas's species somewhat doubtfully as a synonym, as I have not been able to examine his description and figures.

Mr. Miskin, to whom *T. arinia* was unknown, has placed *D.* (= *T.*) *albastola* under Cramer's name *T. cyanea* (Ann. Queensl. Mus. no. 1, p. 50, 1891).

Genitalia. Clasp broad, united at each lower extremity from the apical lower end to the tip; the margin is crescent-shaped and is strongly serrated, the apex itself being produced upwards and terminating in a square tip. Fork long, slender, and deeply divided. Tegumen arms narrow. Penis with inner base bladder-shaped for ⅓ length, when it suddenly narrows for another ⅓ and at the apical third expands again into a swollen joint, whence it tapers to tip. (Plate XLVII. figs. 7, 7*a*.)

The description is taken from a specimen received from N. Australia.

THYSONOTIS SMARAGDUS, sp. n. (Plate XLVI. fig. 5.)

♂. Allied to *T. arinia*. Upperside much the same but with a small white dot at the end of the cell of the fore wing in place of the whitish patch in *T. arinia*, and an indistinct white blotch in the cell of hind wing. Underside: borders blacker and more distinctly defined; outer marginal border of fore wing narrower than in

T. arinia towards the anal angle; the white submarginal line also narrower. Hind wing: the black streak rather longer, the black submarginal band containing the metallic green lunules, which are considerably smaller than in *T. arinia*, differently situated, the inner edge commencing at the apex and running in a straighter though somewhat broken line to the anal margin, which it reaches decidedly lower down. The shape of the wings is also different from *T. arinia*, the apices of both being more produced and the outer margins considerably straighter.

A short, black, linear, white-tipped tail to the lower median nervule.

Head, thorax, and abdomen concolorous with wings; legs black and white; antennæ black above, spotted with white below.

Expanse $1\frac{3}{10}$ inch.

Hab. Wetter I. (*W. Doherty, Mus. D.*); (*Holy, Mus. Staud.*).

This species, which is the local representative of *T. arinia*, is distinguished by the form of the wings and by the difference in the position of the band on the underside of the hind wings.

Taken by Mr. Doherty in May.

THYSONOTIS SPERCHIUS.

Thysonotis sperchius, Feld. Wien. ent. Mon. iv. p. 245, t. 3. f. 4 (1860)[1].

Cupido sperchius, Oberthür, Ann, Mus. Gen. xv. p. 523 (1880)[2]; Kirsch, Beitr. Lep.-Faun. von Neu-Guinea, p. 127 (1877)[3].

Hab. New Guinea[1]; Soron, Salwatti[2]; Mysore Is.[3].

We have not seen this species, but the position of the white band on the underside of the hind wing and the broken border on the outer margin of fore wing below seem to distinguish it from the following species, *T. pindus*, to which it is closely allied, although M. Oberthür in his Lép. Océan. (Ann. Mus. Gen. xv.) places two other species between them.

THYSONOTIS PINDUS. (Plate XLVI. fig. 11.)

Lycæna pindus, Feld. Reise Nov., Lep. ii. p. 267, t. 33. ff. 17–18, ♀ (1865)[1].

Cupido pindus, Oberth. Ann. Mus. Gen. xv. p. 523 (1880)[2].

Hab. Ternate (*Wallace*)[1]; New Guinea, Salwatti, Andai[2]; Batchian (*Platen*) (*Mus. Staud.*), (*Wallace*) (*Mus. G. & S.*).

The specimens before us from Batchian agree well with Dr. Felder's figure. The male on the upperside is scarcely distinguishable from that sex of *T. arinia*.

THYSONOTIS CHROMIA.

Thysonotis chromia, H. H. Druce, P. Z. S. 1891, p. 365, pl. xxxii. f. 3.

Hab. Solomon Is.

Allied to the two preceding species, but has much narrower black borders on the upperside, besides differences below.

THYSONOTIS ILLUSTRIS.

Plebeius illustris, Rober, Iris, i. p. 53, t. iv. f. 6 (1885).

Hab. Key Is.

We have not seen a specimen of this species. The male only is described, and seems to differ from that sex of *T. pindus* in the hind wing possessing a submarginal row of lunules which are entirely absent in that species. Although Herr Rober's figure does not show any tail, we feel sure that it should do so and consequently place it in this group. His figures are photographs, and this one appears to show signs of having been repaired near the anal angle.

THYSONOTIS (?) MIRACULUM, sp. n. (Plate XLVI. fig. 12.)

♀. Upperside uniform dull brown; a few whitish scales on fore wing just above the submedian nervure; hind wing with a small irregular whitish patch rather before the middle of the costal margin extending slightly into the cell; basal half of anal margin whitish. Cilia of fore wing brown, whitish at anal angle, of hind wing alternately brown and whitish. Underside—both wings brown as above but rather darker, fore wing with a costal border of metallic bluish green consisting of streaks of scales between the nervules from their bases almost to the costal margin, thickest and most prominent at the base of the wing and terminating gradually rather before the apex; outer margin with a border consisting of a row of distinct metallic bluish-green crescent-shaped lunules placed between the nervules and extending from the apex to the anal angle. Inner margin creamy white from base almost to anal angle, slightly extending into the wing towards the middle. Hind wing margined with a row of irregular metallic spots from the apex, where is the largest, to the anal angle, the two spots following the large one at the apex very small but distinct.

Head, thorax, and abdomen brown above, brownish white below; front of head black, with a distinct metallic blue streak on the inner side of each eye. Palpi white, tipped with black. Antennæ brown above, spotted with white towards the base below. Legs wanting.

Expanse $1\frac{9}{10}$ inch.

Hab. Waigiou (*Platen*).

The type specimen of this curious species, which is in Dr. Staudinger's collection, is the only example we have seen. Another genus will have to be erected for it, as the first subcostal nervule of the fore wing is entirely separate from the costal nervure and the fourth subcostal is emitted much higher up the third than in typical *Thysonotis*, but without seeing the male we do not care to propose a new generic name and have placed it provisionally in *Thysonotis*.

Lycæna aleuas, Felder, and its allies, which have been placed in *Danis* by various authors, are not included here, as in our opinion they are not congeneric and are better placed in *Lampides*.

EXPLANATION OF THE PLATES.

Plate XLV.

Fig. 1. *Thysonotis serapis*, ♂, p. 539.
2. —— ——, ♀, p. 539.
3. —— *danis*, var. *karpaia*, ♂, p. 540.
4. —— ——, ——, ♀, p. 540.
5. —— *apollonius*, ♂, p. 541.
6. —— ——, ♀, p. 541.
7. —— ——, var. *supous*, nov., ♀, p. 542.
8. —— *philostratus*, ♂, p. 543.
9. —— *perpheres*, ♂, p. 544.
10. —— ——, ♀, p. 544.

Plate XLVI.

Fig. 1. *Thysonotis caledonica*, ♂, p. 545.
2. —— *melimnos*, ♀, p. 544.
3. —— *korion*, ♂, p. 547.
4. —— *eudocia*, ♂, p. 548.
5. —— *smaragdus*, ♂, p. 550.
6. —— *arinia*, ♂, p. 550.
7. —— ——, ♀, p. 550.
8. —— *brownii*, ♂, p. 547.
9. —— *piepersii*, ♀, p. 548.
10. —— *epicoritus*, ♂, p. 550.
11. —— *pindus*, ♂, p. 551.
12. —— (?) *miraculum*, ♀, p. 552.

Plate XLVII.

Figs. 1, 1*a*, 1*b*. *Thysonotis danis*, p. 539.
2, 2*a*. —— *apollonius*, p. 542.
3, 3*a*. —— *philostratus*, p. 543.
4, 4*a*. —— *schaffera*, p. 545.
5, 5*a*, 5*b*. —— *taygetus*, p. 546.
6. —— *cyanea*, p. 549.
7, 7*a*. —— *arinia*, p. 550.

2. Descriptions of new Species of Butterflies from the Island of St. Thomas, West Africa. By Emily Mary Sharpe.

[Received June 2, 1893.]

The Butterflies which I have the pleasure of describing in the present paper have been submitted to me by Prof. Barboza du Bocage, the Director of the Lisbon Museum. They were obtained in the island of St. Thomas by Senhor Francesco Newton.

Fam. Nymphalidæ.

Subfam. Danainæ.

Danais chrysippus.

Danais chrysippus (Linn.); Kirby, Syn. Cat. Diurn. Lepid. p. 6.

Subfam. SATYRINÆ.

MELANITIS LEDA.

Melanitis leda (Linn.); Kirby, Syn. Cat. Diurn. Lepid. p. 43.

Subfam. ACRÆINÆ.

ACRÆA ZETES.

Acræa zetes (Linn.); Kirby, Syn. Cat. Diurn. Lepid. p. 131.

ACRÆA NIOBE, sp. n.

General colour brownish black, with large spots on both wings, being very distinctly pronounced and of a velvety black appearance.

Fore wing. Costa and inner margin brown, apex and hind margin darker, as also the base of wing; discoidal cell from base to apical portion transparent grey, including the discal area and extending below the first median nervule. Between the latter and the submedian nervure are two black spots, one near the base and the second one near the hind margin; above the first median nervule is a third spot, close to the discoidal cell, followed by a fourth one between the second and third median nervules. Immediately above this third median nervule follow three black spots very close together, but all situated between the above-mentioned nervule and the second and first discoidal or radial nervules. There is a large black spot at the end of the cell, with a second one about halfway from the base of the wing.

Hind wing. Brownish black with darker border on hind margin, rather inclined to become transparent across the disk. Base of wing very thickly spotted with black, the spots becoming more separated and more distinct towards the disk. As in the fore wing, there is a large black spot at the end of the cell. From the costal nervure to below the submedian nervure is a submarginal row of black spots, but each spot distinctly between each nervule.

Underside. Both wings much lighter brown than on the upperside, with the borders and all the spots very distinctly indicated.

Thorax and body black; abdomen deep red, with a little red also between the head and thorax.

Expanse $2\frac{1}{2}$ inches.

My friend Dr. Staudinger has had an example of this species in his collection for some time under the MS. name of *A. niobe*. He has kindly sent me over his type for comparison, and I have had much pleasure in describing the species under the name which he had given to it.

ACRÆA NEWTONI, sp. n.

Similar to *A. peneleos*, Ward, but at once distinguished by the absence of any bright colour on the fore wing.

Fore wing. Entirely black with three transparent grey spaces, just prevented from representing one large patch by the black lines of the second and third discoidal nervules. This grey patch

occupies the apical portion of the wing; one large transparent spot is distinctly marked between the first and second median nervules.

Hind wing black, with a well-defined band of orange-red crossing the discal portion from the costal margin to the inner margin; this is followed by a black border along the hind margin. Base of wing with a few indistinctly marked black spots.

Underside.—Fore wing. Similar in colour and markings to the upperside, but lighter.

Hind wing. Similar to the upper surface but much paler, the black spots at the base of the wing being much more forcibly indicated. The red band much more subdued in tint.

Hab. St. Nicolau.

Expanse 2 inches.

ACRÆA INSULARIS, sp. n.

Allied to *A. bonasia*, Fabr., but easily distinguished by the colour of the fore wing.

Fore wing. General colour brownish black, relieved by spots of orange-red. This species has two small red spots near the apex in place of the large oval patch of *A. bonasia*. Near the end of the discoidal cell is a spot, followed by a larger one between the first and second median nervules; directly under the latter nervule, while somewhat nearer to the hind margin, is a small triangular-shaped spot of red. The middle of the cell has a small ovate spot of orange somewhat paler in tint.

Hind wing. With a broad brownish-black border on the hind margin extending along the costa and occupying the base of the wing. The whole of the central portion of the wing orange-red, becoming pale yellow below the first median nervule. This portion of the wing has several small black spots, with a larger one marking the middle of the discoidal cell; there is one spot between the submedian nervule and the first median nervule, followed by two minute spots placed one above the other below the first-named nervule. At the end of the cell are three spots varying in size between the third median, radial, and second subcostal nervules, and just above the middle spot there is another situated in the fork of the radial and the first discocellular nervule.

Underside. Very similar to that of *A. newtoni*, the markings of the upper surface being plainly indicated on the underside.

Hab. St. Nicolau.

Expanse 2 inches.

Subfam. NYMPHALINÆ.

JUNONIA SINUATA.

Precis sinuata, Plötz, Stett. ent. Zeit. p. 477 (1880).

connecting the two. A broad streak of orange colour extends along the inner margin.

The underside of the body is similar to *R. keithloa*, but on the upper surface the head and thorax are a bright blue-green, with the body dark brown.

Hab. Angolares.

Expanse $2\frac{1}{2}$ inches.

PTERYGOSPIDEA FLESUS.

Tagiades flesus (Fabr.); Kirby, Syn. Cat. Diurn. Lepid. p. 635.

PARNARA NISO.

Parnara niso (Linn.); Kirby, Syn. Cat. Diurn. Lepid. p. 597.

3. On the Dentition of a Gigantic Extinct Species of *Myliobatis* from the Lower Tertiary Formation of Egypt. By A. SMITH WOODWARD, F.Z.S.

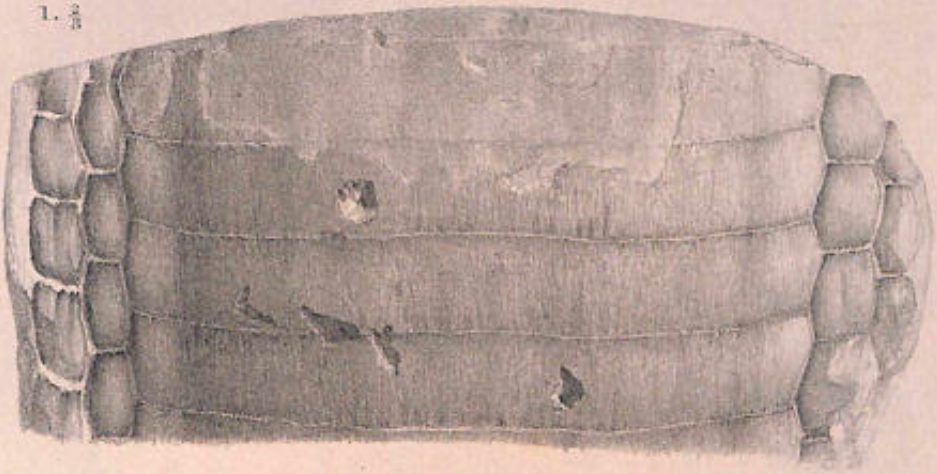
[Received June 20, 1893.]

(Plate XLVIII.)

The Skates of the family of Myliobatidæ are well known to attain a great size, but few examples even of the dentition of the largest specimens are preserved in museums. It is therefore of much interest to record that the British Museum has lately received from Surgeon-Captain R. H. Penton a good example of the jaws of one of the most gigantic extinct species of *Myliobatis*, discovered in the Lower Tertiary Limestone of the Mokattam Hills, near Cairo, Egypt. So far as the present writer is aware, this is the largest specimen of the dentition of *Myliobatis* that has hitherto reached any museum.

Each jaw is in a separate piece of limestone, but the two portions are known to have been found in association; and, as usual in the Myliobatidæ, one dentition (lower) is flat, while the other (upper) is much bent from front to back. Of the lower jaw, partly shown in the figure (Plate XLVIII. fig. 2), about 17 series of plates are preserved, 10 being worn; while of the upper jaw (fig. 1) only 6 series remain. The unworn teeth are almost smooth, being marked only by short feeble longitudinal striæ or rugæ. In both jaws the oral surface is arched from side to side, very gently in the lower, more strongly in the upper jaw, as well shown in the sections figs. 1 *a*, 2 *a*. The principal teeth are very slightly arcuated and not strongly reflexed at the extremities; and the narrow lateral teeth have their long axes directly antero-posterior, not oblique. As an abnormality, it is also interesting to note in the upper dentition that the two outer lateral series are fused together on one side, while the two inner lateral series are similarly fused on the other side.

1. $\frac{2}{3}$



1a.



2a.

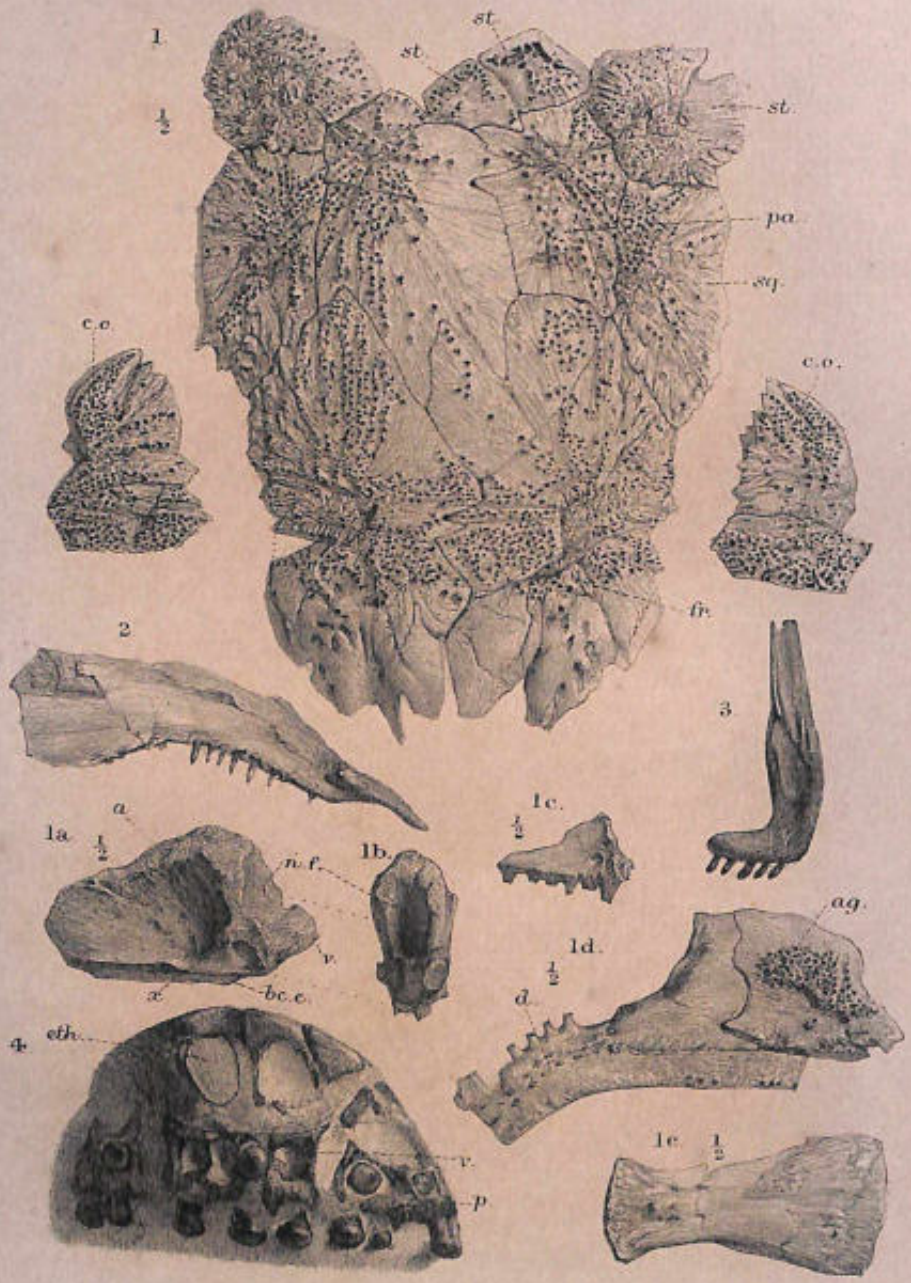


2. $\frac{2}{3}$



F. H. Michael del. et lith. Mintern Bros. imp.

MYLIOBATIS PENTONI.



P.H. Michael del. et lith.

MESOZOIC GANOID FISHES.

Mintern Bros. imp.



MESOZOIC GANOID FISHES.
1, 2, 3. EPIDOTUS. 3a, 3b. LAPEDIUS.

The following is a table of measurements :—

	Upper Dentition.	Lower Dentition.
	m. m.	m. m.
Width of median dental plates..	0·13 to 0·135	0·12 to 0·13
Length „ „ ..	0·18	0·014 to 0·016
Maximum width of three lateral series of plates	0·02	0·02

From these measurements it is evident that the principal teeth in the lower jaw are about eight times, those of the upper jaw about seven and a half times as broad as long; while the maximum thickness of the same teeth in both jaws equals nearly one-quarter of their breadth. These characters, taken in conjunction with the form and proportions of the lateral teeth, suffice to distinguish the Mokattam specimen from the dentition of all known species of *Myliobatis*; and it may therefore be named *M. pentoni* in honour of its discoverer. In determining such specimens it is, of course, necessary to take into account the mode of growth of the teeth and their change in proportions with age; but it does not appear possible, in accordance with the ordinary laws of growth, for any known type of dentition to develop by increase of size into the one now described. The form of the lateral teeth and the transverse section of the median teeth seem to be nearly constant at all stages of growth in any one species.

Materials for comparison are unfortunately insufficient to form any certain estimate of the size of *Myliobatis pentoni*; but if the few small examples of the recent *Myliobatis aquila* in the British Museum are at all similar in proportions, the maximum width of the disk of the extinct species cannot have been much less than five metres.

EXPLANATION OF PLATE XLVIII.

Fig. 1. *Myliobatis pentoni*, sp. nov.; portion of upper dentition, two-thirds nat. size. Lower Tertiary, Mokattam Hills, Cairo. 1 *a*. Transverse section of crown of median tooth.

2. Ditto; portion of lower dentition of same fish, two-thirds nat. size. 2 *a*. Transverse section of crown of median tooth.

The original specimen was presented to the British Museum by Surgeon-Captain R. H. Penton, June 1893.

4. On the Cranial Osteology of the Mesozoic Ganoid Fishes, *Lepidotus* and *Dapedius*. By A. Smith Woodward, F.Z.S.

[Received June 20, 1893.]

(Plates XLIX. & L.)

One of the earliest attempts to describe the skeleton of a Lower Mesozoic fish was based upon *Lepidotus*[1], and the same genus still affords the most satisfactory material for determining the

[1] F. A. Quenstedt, 'Ueber *Lepidotus* im Lias Württembergs.' 4to, Tübingen, 1847.

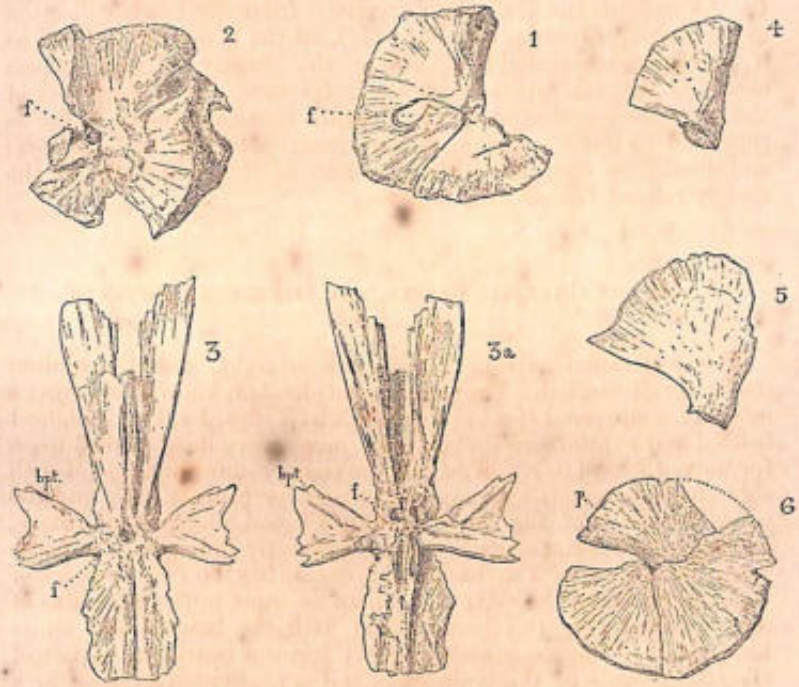
essential features in the osteology of the group to which it belongs. The exoskeleton is so robust that it is usually well preserved, and the internal bones also exhibit a high degree of ossification. As found in the Oxford Clay of Northamptonshire and in the Wealden of Sussex, the remains are in an especially good condition; and the discoveries of Messrs. Alfred N. Leeds and Samuel H. Beckles respectively render it possible to obtain information concerning nearly all the more important characters of the skeleton. In the case of one Oxfordian specimen from the Leeds collection in the British Museum (no. P. 6841[1]), all the bones are isolated as if carefully macerated; in others the display of the various elements depends upon accidents in fracture. It is the object of the present communication to describe these specimens so far as they add to our knowledge of the cranial osteology of *Lepidotus*; and finally to compare with the skull of this genus that of the closely related Liassic fish, *Dapedius*.

1. On the Cranial, Facial, and Opercular Bones of *Lepidotus*.

The basicranial axis in *Lepidotus* is straight, and the cranium itself is well ossified. The *basioccipital* element, known only from a laterally compressed specimen (Plate XLIX. figs. 1 *a*, 1 *b*), is highest behind and exhibits on its posterior face a very deep conical fossa for the notochord (*n.f.*). Towards the postero-inferior angle of each side there is a small acuminate tubercle or process (*x*); and the inferior aspect of the bone exhibits a broad longitudinal groove, with a flattened rim on each margin, evidently indicating the backward extension of the basicranial canal (for the recti muscles of the eye) as far as the occiput. There is some appearance also of one vertebral ring (*v.*) being fused with the basioccipital on its hinder face. The *exoccipital* (fig. 1) forms a considerable part of the lateral wall of the brain-case, and is perforated as usual by a large, transversely oval foramen (*f.*) for the exit of the vagus nerve. The *pro-otic* (fig. 2) has a still larger extent than the exoccipital, and exhibits a deep, oblique notch (*f.*) at its anterior margin for the passage of the fifth nerve. In the *interorbital septum* there is as yet no evidence of ossification, and particulars are similarly wanting as to the nature of the *pterotic* and *opisthotic* bones. Of the rostral region it can only be said that the *ethmoids* are arranged in such a manner that the olfactory nerves must have passed through a pair of long, closed canals, well shown in a Wealden fossil in the British Museum (Plate XLIX. fig. 4, *eth.*).

[1] This is the type specimen of a new species, *Lepidotus latifrons*, diagnosed in the forthcoming Catal. Foss. Fishes, Brit. Mus. pt. iii. Its principal distinctive characters are:—External head- and opercular bones ornamented with conspicuous tuberculations; all the teeth with much elevated crowns. Premaxilla with six teeth. Each frontal bone twice as long as its maximum breadth; operculum three times as deep as broad.

The membrane-bones of the cranial roof do not extend backwards quite so far as the occipital border, the narrow space thus left being covered by the supratemporal plates. There are two principal pairs of bones, the short *parietals* (Plate XLIX. fig. 1, *pa.*) behind, and the longer *frontals* (*fr.*) forwards, not bilaterally symmetrical, and uniting in all directions by very irregular angulated sutures. More anteriorly there would be the *nasals*, but



Head-bones of *Lepidotus latifrons*; Oxford Clay, Peterborough. One half nat. size.

1. Exoccipital. 2. Pro-otic. 3. Parasphenoid, inferior aspect. 3 *a*. Parasphenoid, superior aspect. 4. Right quadrate, inner aspect. 5. Left quadrate, outer aspect. 6. Metapterygoid.

bpt., basipterygoid process; *f.*, foramen; *p.*, process.

these are not satisfactorily known. The long and narrow *squamosal* element (*sq.*) on each side reaches as far forwards as the anterior extremity of the parietals, but not so far backwards as the hinder margin of these bones. It is considerably overlapped behind by the supratemporal series of plates, and on the inner

aspect there is an undetermined amount of connection with some of the ossified otic elements. The surface for articulation with the upper extremity of the hyomandibular is clear, and a triangular walled area at the hinder end of its inner face denotes the boundaries of the small temporal fossa. Postfrontal and prefrontal membrane-bones are not differentiated from the circumorbital ring, and the cheek-plates are irregularly subdivided, being often different even on the two sides of the same head. The general plan of the *cheek-plates*, however, is distinct, there being a complete circumorbital ring, a semicircle of postorbitals, and a short, deep series of preorbitals flanking the ethmoid region[1]. The *maxilla* (Plate XLIX. fig. 2) is a very delicate bone, deepest behind, tapering forwards, and terminating in front in an inwardly-directed process for articulation with the palatine; its oral margin is provided with a series of styliform teeth. The *premaxilla* (Plate XLIX. figs. 1 *c*, 3) is a smaller, stouter bone, also with a single series of styliform teeth, and bearing at its inner extremity a very large ascending process which fits in a groove on the inferior aspect of the frontal bones.

The base of the cranium is sheathed by a great parasphenoid bone and by the coalesced dentigerous vomers. The *parasphenoid* (fig. 3) is narrowest at the origin of the large, fan-shaped basipterygoid processes (*bpt.*), expanding much behind and exhibiting a deep cleft in its hinder margin. It is pierced mesially by a foramen (*f.*) for the passage of the internal carotids, which appears single on the lower face but double on emerging above; the superior or attached face (fig. 3 *a*) also shows the deep excavation forming the floor of the basicranial canal. The *vomer* is a stout thickened bone with crushing teeth, showing cavities in which the germ-teeth are formed (Plate XLIX. fig. 4); and the dentigerous bones of the palato-pterygoid arcade, closely connected with the vomer in front, exhibit a similar thickening.

The *hyomandibular* (Plate L. fig. 2) is an elongated, laterally compressed bone, with its long axis slightly bent at the origin of the process of support for the operculum (*p.*). It is somewhat strengthened by longitudinal ridges on the outer face, and the surface for attachment with the cranium is much extended. The bone is not pierced by any foramen. The *symplectic* element remains unknown, but the hinder border of the quadrate exhibits an inner surface evidently for union with it. The *quadrate* (figs. 4 and 5) is slender for a fish with so powerful a dentition, and in the fine example of *Lepidotus latifrons* from the Oxford Clay this element is of much interest as exhibiting a very different degree of ossification on the two sides. The *metapterygoid* bone (fig. 6) is also comparatively delicate, but it shows a broad facette on its upward and anteriorly directed process, which may have articulated with some lateral element of the cranium.

The hinder portion of Meckel's cartilage is ossified as a robust

[1] See figures by Quenstedt, *op. cit.*

articular bone, and to its outer face there is apposed a large plate, probably to be interpreted as *angular* (Plate XLIX. fig. 1 *d*, *ag.*). The coronoid region of the mandible is very deep, and the summit of the elevation is completed by a very small *surangular* bone, shown in a Wealden specimen of *L. mantelli* (Brit. Mus. no. P. 6342). The *dentary* bone (*d.*), very deep in the coronoid region, becomes much narrower in its tooth-bearing portion; and its anterior half curves rapidly inwards to meet its fellow of the opposite side in a somewhat deepened symphysis. To the inner side of the dentary bone the robust *splenial* is articulated by a roughened face, and it also enters the mandibular symphysis; whereas the dentary exhibits only one regular series of teeth, this element has several irregular series of a more tritoral character.

The *ceratohyal* (Plate XLIX. fig. 1 *e*) exhibits its ordinary hourglass-shaped form, and is deepest behind. The *hypohyals* are a pair of very small triangular bones (seen in Brit. Mus. no. P. 6341); and no evidence of an ossified glossohyal has hitherto been observed.

The opercular apparatus is complete, and there is a good series of branchiostegal rays, the uppermost very broad; but no indications of a gular plate have yet been discovered in *Lepidotus*. The last-named fact is all the more remarkable, since in closely allied genera (e.g., *Dapedius*) the gular plate is relatively large and robust. The *preoperculum* (Plate L. fig. 1, *p.op.*) is a long narrow bone, exposed throughout its length and much bent forwards below. The *operculum* (*op.*) exhibits a sharp elevation on its inner face for articulation with the hyomandibular process; its upper border is overlapped by the supratemporal plates, and its lower border deeply overlaps the *subopercular*. The latter element (*s.op.*) is almost sickle-shaped, with a very large upwardly-directed process at its antero-superior angle, and abruptly truncated in front for union with the large elongate-triangular *interoperculum* (*i.op.*)

The *supratemporal* plates vary much in arrangement in different species of *Lepidotus*, but they always overlap both the cranial roof-bones and the most anterior dorsal scales. In *L. latifrons* (Plate XLIX. fig. 1, *st.*) there is one not quite symmetrical pair of outer plates, occupying the space between the operculum, squamosal, and parietal on each side; and there are three symmetrically arranged plates no larger than ordinary scales apposed to the hinder margin of the parietals. In *L. mantelli* the supratemporals are in three pairs, the two outer ones corresponding to the single outer pair in *L. latifrons*. In *L. elvensis*, as already described by Quenstedt, the supratemporal series consists of a single pair of large plates, as in *Amia*.

II. On the Cranium of *Dapedius*.

The Liassic genus *Dapedius* is so closely related to *Lepidotus*, that it is interesting to compare the characters of the skull in these two fishes. So far as the external bones are concerned, the restora-

tion of *Dapedius* already published by Dr. Traquair [1] suffices for the purpose; but the cranium itself is shown only in one specimen from Lyme Regis (Brit. Mus. no. P. 3541), which seems worthy of description as an appendix to the foregoing account of *Lepidotus*.

As seen in side view (Plate L. fig. 3), the basicranial axis of *Dapedius* is sharply bent upwards in front of the otic region—an arrangement perhaps correlated with the deepened form of the fish. As in *Lepidotus*, the cranial cartilage is well ossified, and there seems to have been a complete, or nearly complete, interorbital septum. The *basioccipital* element (*b.occ.*) is deep, much excavated behind for the notochord (*n.f.*), and longitudinally grooved below for the basicranial canal (*bc.c.*). The divisions between the elements of the cranium and the situation of the foramina for the nerves are unfortunately not distinguishable; but it is clear that there was an ossified *supraoccipital* (*s.occ.*), with a vertical median ridge behind, and there are robust ossifications in the *prefrontal* and *postfrontal* regions. The *ethmoidal* region (*e.*) terminates in front in a small blunt process, pierced transversely by a large foramen; and it expands on each side, in advance of and below the prefrontal, into a great mass that would be sheathed by the vomer. The olfactory nerve evidently passed through a foramen (*f.*) between the prefrontal and ethmoid, there being no elongation of this foramen into a canal. Of the membrane-bones of the cranial roof, the *parietals*, *frontals*, and *squamosals* are fused into a continuous plate (*pfs.*); while, as in *Lepidotus*, a narrow rim of the cranium projects behind the covering thus formed. Viewed from behind (Plate L. fig. 3 *a*, *m.*), there is seen to be a small cavity on each side between the cranium and the squamosal portion of the roof, this being evidently the reduced temporal fossa.

III. Conclusion.

From the observations now recorded it would be premature to make any very general deductions, the characters of the skull having yet to be discovered in the majority of the Mesozoic fishes. The new facts, however, are interesting as tending to confirm a conclusion that must have impressed everyone who has deeply studied these extinct fishes, namely, that it is impossible in Jurassic and early Cretaceous formations to recognize any absolute subdivision of the so-called Ganoids into "Lepidosteoidei" and "Amioidei." The skulls of *Lepidosteus* and *Dapedius* differ from those of existing "ganoids" in exhibiting the backward extension of the basicranial canal; and the cartilaginous cranium of *Dapedius* is remarkably similar in every respect to that of the modern salmon (*Salmo*), except somewhat more ossified. Both *Lepidotus* and *Dapedius* agree with *Lepidosteus* and *Amia* in the fact that the membrane-bones of the roof do not extend quite to the occipital

[1] R. H. Traquair, "On the Structure and Affinities of the Platysomidæ," Trans. Roy. Soc. Edinb. vol. xxix. (1879) pl. vi. fig. 13.

border of the cranium; but *Dapedius* at least is distinguished from *Amia* and approximated to *Lepidosteus* by the course of the olfactory nerves across the orbital cavity, while *Lepidotus* is paralleled only by the last-named genus in the absence of a gular plate. On the other hand, the superficial bones of the two extinct genera differ greatly from those of *Lepidosteus* and closely resemble those of *Amia*; the peculiar attachment of the premaxilla in *Lepidotus*, for example, being reproduced almost in detail in the last-named genus.

EXPLANATION OF THE PLATES.

Plate XLIX.

Fig. 1. *Lepidotus latifrons*, sp. nov.; cranial roof, upper aspect, one half natural size. Oxford Clay; Peterborough. [B.M., no. P. 6841.]
c.o., circumorbital; *fr.*, frontal; *pa.*, parietal; *sq.*, squamosal; *st.*, supratemporal.
1 *a*, *b*. Basioccipital, lateral and posterior aspects.
a, surface of attachment for lateral bones of cranium; *bc.c.*, basicranial canal; *n.f.*, notochordal fossa; *v.*, supposed vertebra; *x*, lateral process.
1 *c*. Right premaxilla, showing base of ascending process.
1 *d*. Portion of left mandibular ramus, outer aspect.
ag., angular; *d.*, dentary.
1 *e*. Ceratohyal.
2. Ditto; right maxilla. Ibid. [B.M., no. P. 6838.]
3. *Lepidotus minor*, Ag.; right premaxilla. Purbeck Formation; Swanage. [B.M., no. 48371.]
4. *Lepidotus mantelli*, Ag.; transverse section of snout. [B.M., no. P. 6342.]
eth., canal through ethmoid bones; *p*, palato-pterygoid arcade; *v.*, vomer.

Plate L.

Fig. 1. *Lepidotus latifrons*, sp. nov.; opercular apparatus of left side, one half natural size. Oxford Clay; Peterborough. [B.M., no. P. 6841.]
br., branchiostegal ray; *i.op.*, interoperculum; *op.*, operculum; *p.op.*, preoperculum; *s.op.*, suboperculum.
2. Ditto; hyomandibular, one half natural size. Ibid. [B.M., no. P. 6840.]
p., process for operculum.
3. *Dapedius*, sp.; cranium from the lateral, posterior (3 *a*), and anterior (3 *b*) aspects. Lower Lias; Lyme Regis. [B.M., no. P. 3541.]
b.occ., basioccipital; *bc.c.*, basicranial canal; *e.*, ethmoidal region; *f.*, foramen for olfactory nerve; *m.*, temporal fossa; *n.f.*, notochordal fossa; *pfs.*, parieto-fronto-squamosal shield; *s.occ.*, supra-occipital.
4. *Dapedius granulatus*, Ag.; premaxillæ (*pmx.*) and ethmoidal dermal plate (*eth.*), anterior aspect. Lower Lias; Lyme Regis. [B.M., no. P. 3538.]

B.M.=British Museum. Unless otherwise stated the figures are of the natural size.

5. A List of the Coleoptera, of the Family *Cleridæ*, collected by Mr. Doherty in Burmah and Northern India, with Descriptions of new Species; and of some Species from Borneo, Perak, &c., from the Collection of Alexander Fry, Esq. By Rev. H. S. Gorham, F.E.S., F.Z.S., &c.

[Received June 17, 1893.]

The present paper is to some extent a sequel to one published by me in the 'Annals' of the Genoa Museum in 1892, on the *Cleridæ* collected by Signor L. Fea.

The great number of new species met with by Mr. Doherty in the same genera shows how rich the north-east frontier district must be in the beautiful and interesting family here treated of.

For general remarks on the genera I must refer to the account of Mr. Fea's collection, the subject matter being so very similar.

Twenty-eight species are now described as new.

CALLIMERUS DULCIS.

Clerus dulcis, Westw. P. Z. S. 1852, p. 40, t. 24. f. 6.

Callimerus dulcis, Gorh. Cist. Ent. 1876, p. 64; Ann. Mus. Gen. ser. 2, xii. p. 722.

Burmah, Momeit.

CALLIMERUS AMABILIS.

Callimerus amabilis, Gorh. Cist. Ent. 1876, p. 66; Ann. Mus. Gen. 2, xii. p. 723.

Assam, Naga Hills.

CALLIMERUS MIRANDUS.

Callimerus mirandus, Gorh. Cist. Ent. 1876, p. 65.

Perak.

A very beautiful species. Five specimens.

CALLIMERUS SUAVIS.

Callimerus suavis, Gorh. Ann. Mus. Gen. 2, xii. p. 722.

N. India, Manipur.

CALLIMERUS ELEGANS.

Callimerus elegans, Gorh. Ann. Mus. Gen. 2, xii. p. 720.

Assam, Naga Hills. One specimen, in bad condition.

CALLIMERUS GRACILIS.

Callimerus gracilis, Gorh. Mus. Gen. 2, xii. p. 724.

Burmah, Momeit. Two examples.

CALLIMERUS LATESIGNATUS.

Callimerus latesignatus, Gorh. Ann. Mus. Gen. 2, xii. p. 728.

Assam, Naga Hills. Two examples.

CALLIMERUS RUSTICUS.

Callimerus rusticus, Gorh. Notes from Leyden Mus. v. p. 252 (1883).

Borneo, Labuan; Perak. Five examples.

CALLIMERUS LATIFRONS.

Callimerus latifrons, Gorh. Cist. Ent. 1876, p. 67.

Borneo, Pengaron; Perak. One example from each locality.

CALLIMERUS INSOLATUS.

Lemidia insolata, Pascoe, Journ. of Ent. i. p. 48.
Callimerus insolatus, Gorh. Cist. Ent. 1876, p. 67.

Assam, Patkai Mountains, Perak.

TILLUS BIRMANICUS.

Tillus birmanicus, Gorh. Ann. Mus. Gen. 2, xii. p. 729.

Assam, Sudiya.

TILLUS NOTATUS.

Tillus notatus, Klug, Mon. Abhand. Berl. Acad. 1842, p. 276.

Burmah, Ruby Mines; Assam, Sudiya.

Var. *Prothorace elytrisque nigris, his fasciis duabus apiceque albidis.*

Burmah, Karen Mountains.

CLADISCUS SANGUINICOLLIS.

Tillus sanguinicollis, Spinola, Mon. Clérites, i. p. 125, tab. xv. f. 7; nec *Cladiscus sanguinicollis*, Lac. Gen. des. Col. tab. 45. f. 4.

Assam, Patkai Mountains (*Doherty*); Andaman Islands (*Roepstorff*); Burmah, Karen Mountains (*Fea*).

This is the insect referred to by me as *C. strangulatus*, Chevr. (Ann. Mus. Civ. Gen. 2, xii. p. 730); considerable confusion has occurred from M. Chevrolat having quoted *T. sanguinicollis* as a synonym of his *C. strangulatus*, Lacordaire having figured what is presumably that species under the name of *Cladiscus sanguinicollis*. They are obviously quite distinct from the species figured by Spinola. Although it is but a mutilated specimen that Spinola had seen, enough is shown to prove that his insect had simply serrate antennæ.

TILLICERA JAVANICA.

Tillicera javanica, Spin. Mon. i. p. 160, t. 12. f. 2; Gorh. Ann. Mus. Gen. 2, xii. p. 731.

Burmah, Ruby Mines; Assam, Sudiya; India, Manipur.

HEMITRACHYS BIZONATUS.

Hemitrachys bizonatus, Gorh. Cist. Ent. 1876, p. 92.

Perak (*Doherty*). One example.

I have not seen any other specimens of this insect, since I described it from a pair obtained by Wallace.

STIGMATIUM. (The species of *Stigmatium* are exceedingly obscure and will need further revision.)

STIGMATIUM CICINDELOIDES.

Stigmatium cicindeloides, Gray in Griffith's Anim. Kingd. i. p. 376, t. 43. f. 2; Spin. Mon. i. p. 176, t. 13. f. 4.

The identification of these insufficiently described species must necessarily be problematical. There is little doubt, however, that the insect figured by Spinola is the species of which I have seen many specimens from Malacca, Java, and the neighbouring islands. The blue or green tint on the thorax shown by Spinola is not constant, but is characteristic of the species when it occurs.

Perak.

STIGMATIUM RUFIVENTRE.

Stigmatium rufiventre, White, Cat. of Cleridæ in Brit. Mus. p. 54 (1849); Westw. Proc. Zool. Soc. 1852, p. 45, t. 26. f. 5 ("*Clerus rufiventris*").

Very close to *S. cicindeloides*, larger and with the metasternum and abdomen and base of the legs red: the original description is White's. Possibly only a large form of a widely distributed species.

Assam (*Doherty*).

STIGMATIUM MUTILLÆCOLOR.

Tillicera mutillæcolor, White, Cat. of Cleridæ, p. 51.

Stigmatium dimidiatum, Chev. Rev. et Mag. de Zool. 1874, p. 63.

Stigmatium mutillæcolor, Gorh. Cist. Ent. 1876, p. 72; Ann. Mus. Gen. 2, xii. p. 740.

Burmah, Momeit.

STIGMATIUM BASIPENNE.

Stigmatium basipenne, Chevr. Rev. et Mag. de Zool. 1874, p. 64.

Stigmatium humerale (ined.), coll. W. W. Saunders.

Perak (*Doherty*); many specimens.

Singapore (*Wallace*).

The general colour of this insect is deep black; the middle of the body beneath is vaguely brownish red; the front of the head, basal half of the antennæ, the reflexed margin of the base of the thorax, the base of the elytra (the shoulders more widely), the scutellum, the front tarsi, the tips of the middle and posterior tarsi, and the trochanters are rusty red. The elytra are striated nearly to the apex, becoming granulose there; and the interstices

are granulose, or rather are broken by the coarse punctures of the striæ in the basal half.

I have possessed this species for many years, under the name *humerale*. M. Chevrolat's description is not very accurate, as in a very long series of examples I do not find any with two linear grey fasciæ. The legs are black, with the exceptions which I have pointed out; the femora are not more stout than is usual in the smaller species of this genus. The application of the name *humerale* came about by a reprehensible system of so labelling species which it was *intended* to describe; my specimens were probably so named by White for the late Mr. W. W. Saunders, and it is well that that name should now drop for that of M. Chevrolat. It is common apparently at Singapore and Perak.

STIGMATIUM TAPETUM.

Stigmatium tapetum, Gorh. Cist. Ent. 1876, p. 95.
Omadius nebulosus, Klug?, Spin. Mon. ii. p. 133, t. 15. f. 6.

I have already (*l. c.* p. 101) suggested that these may be, and probably are, synonyms, but in such an obscure genus I cannot affirm that they are so.

Perak.

CLADISCUS DISTORTUS, n. sp.

Niger, prothorace obscure rufo; capite crebre, thorace parcius, elytris crebre cribrato-punctatis, apice lævi; antennis articulis 3°–10^m^ ramulis longis a basi exorientibus, apicali subulato; tibiis anticis compressis, medio subincrassatis. Long. 9½ *millim.*

Hab. Camboja.

Black with a slight brown tint, and clothed with long upright hairs; only the thorax is rufous, and the mandibles and two basal joints of the antennæ pitchy red. The thorax is not so conically contracted as in *C. sanguinicollis*, Spin. (to which I refer the species from the Andaman Isles), but the sides are subparallel till they are rounded in to the strangulation. Its disk is very smooth and sparsely impressed with a few distinct points; it is a little depressed in the middle, but with no constricted line in front. The antennæ are remarkable for the mode in which the rami spring from the base of each joint; each ramus is as long as three joints, and the apical joint widens from its base to near the middle, and from thence is awl-shaped. The basal node of the thorax is black and has the usual double tumidity; the front tibiæ are compressed, widened in the middle, and somewhat distorted.

One specimen in Mr. Fry's collection.

CLADISCUS ATTENUATUS, n. sp.

Fere filiformis, niger, antennis quam caput cum prothorace sesquilongioribus, articulis 3°–10^m^ leviter serratis, elytris cribrato-striatis apice lævioribus, callo humerali rufo. Long. 6–6½ *millim.*

Var. ♀? *antennis brevioribus, prothorace obscure rufo.*

Hab. Burmah, Ruby Mines: Manipur (*Doherty*).

Very narrow, the elytra scarcely wider than the front of the thorax, the latter and the head both thickly and obsoletely punctured, brownish black inclining to rusty red at the constricted part. The antennæ with the joints 3 to 10 nearly three times as long as wide, the apical joint rather longer than those preceding it; palpi black. Elytra black, excepting the extreme humeral angle which is dull red, and a little shining. Legs and body black.

Allied to the species recently described by Mr. G. Lewis from Japan as *C. obeliscus*, but apparently differing by the longer antennæ, black scutellum and breast, and by the red shoulder-spot. The specimens which seem to have shorter antennæ, and which may be females, have also often the thorax red excepting the basal nodule.

CLADISCUS RUFICORNIS, n. sp.

Elongatus, sanguineo-rufus, elytris et corpore nigris; nitidus, capite prothoraceque parcissime minute punctatis, antennis his brevioribus leviter serratis. Long. 8–9 *millim.*

Hab. Manipur (*Doherty*).

Very shining and smooth, the head rather large, and with the base of the thorax of about the width of the elytra, sparingly punctured; the thorax much narrowed to the strangulate part, and with a distinct curved impressed line in front.

The antennæ are rather wide, entirely clear red; the joints (after the third) scarcely longer than wide, serrate, their length is not greater than that of the thorax alone. Elytra with series of elongate square punctures terminating at quite a third from the apex; the apex round, a little dehiscent.

Two specimens.

CALLIMERUS DECORATUS, n. sp.

C. dulci *proxime affinis: nigro-cæruleus, nitidus; prothoracis maculis quatuor et lateribus, scutello, elytrorum maculis quatuor in singulis, a sutura æque distantibus, tertia reniforme; corporisque lateribus albo-squamosis; ore, antennis, palpis pedibusque pallidis. Long.* 11 *millim.*

Hab. Assam, Naga Hills (*Doherty*).

This insect is very nearly allied to *C. dulcis*, Westw., in size, form, punctuation, and also in marking, so that it will be sufficient to point out the following points of difference:—In *C. dulcis* there are two large, round, white spots (one on each elytron) rather near their base, in *C. decoratus* the corresponding spots are rather further removed; in *C. dulcis* two small spots nearer the margin follow, in *C. decoratus* these are absent; in *C. dulcis* the pair of spots before the apical spots are clearly double, sometimes not confluent, in *C. decoratus* the same pair are at most reniform. The hind femora are not dark at their apex in the three specimens of *C. decoratus* now before me.

CALLIMERUS MYSTICUS, n. sp.

C. amabili, Gorh., *proxime affinis: nigro-cæruleus, grisco-squamosus; prothorace, linea mediana et lobis lateralibus denudatis, lævibus; elytris nigris, grisco-squamosis, macula elongata suturali communi, lateribus maculis quasi quatuor præbentibus nigris, prima ad punctum parvulum juxta scutellum producta, tertia in fasciam integram ad suturam angustam provectam, quarta retrorsum obliqua. Pedibus flavis, femoribus posticis apicibus extus nigris. Long.* 11 *millim.*

Hab. Borneo, Pengaron (*Doherty*).

It will be sufficient to compare this insect with *C. amabilis*, Gorh. The prothorax is smooth, not punctured. The scales of the upperside are more greenish grey; the pattern is very different, very difficult to describe. The base of the elytra, a plagia running obliquely outward from the scutellum, and a fascia-like spot form by their union an intricate device in the basal half; while an oblique fascia, triangular in shape, and a sutural line, widening at the apex, form a sort of 7 on the left elytron, reversed of course, on the right, somewhat similar to the mark in *C. amabilis* and *C. fœx*, but with the head more oblique. The single specimen appears to be a male, and has the apical dorsal segment formed of two wide laciniæ of fulvous colour.

CALLIMERUS BELLUS, n. sp.

Nigro-cæruleus; antennis, palpis pedibusque testaceis; capitis fronte, prothoracis margine antico et postico, elytrorum basi, lunula humerum cingente, fascia pone medium cum lunula per lineam rectam conjuncta, sutura postice in fasciam obliquam desinente, albo-squamosis. Capite crebre obsolete, prothorace fortiter parcius, elytris fortiter seriatim punctatis. Long. 8 *millim.*

Hab. Borneo, Pengaron (*Doherty*).

The pattern of this *Callimerus* is difficult to describe, but very neatly defined. The thorax is widely margined with white scales before and behind, leaving the middle and the sides denuded and shining, but the bands of scales nearly meet round the sides; the colour of the parts not covered with scales is dark steel-blue; on the elytra are eight areæ thus denuded, viz. two humeral, then three oblong areæ in a row transversely, two of them being lateral and one common on the suture, then two lateral, then a small round apical spot. These are all neatly defined by the white *lines* of scales. The elytra in some examples appear nearly black; the punctures are large, the rows not very distinct, and quite confused at the sides and near the apex. The underside is clothed in the manner usual in this section of the genus, densely at the sides, with white scales.

This is a very beautiful species; it is allied to the following (*C. niveus*), and both remind me of *C. ornatus*, from Sumatra (Notes from Leyden Mus. iv. 110).

CALLIMERUS NIVEUS, n. sp.

Nigro-cæruleus; antennis, palpis pedibusque pallide testaceis; capitis fronte, prothorace antice et postice, scutello, elytrisque albo-squamosis, his areolis quinque fascia subapicali, apiceque denudatis. Long. 8 *millim.*

Hab. Perak (*Doherty*).

This species is punctured as *C. bellus*, but is more densely clothed with white scales, only the base of the head and the disk and a narrow transverse band of the thorax are denuded, and the elytra have a very elegant pattern, the bare parts being a subhumeral spot on each, a common sutural one, then two lateral spots, a rather wide and not very regular fascia, it being widest on the margins, and an apical spot. The elytra have silvery-white hairs over the whole surface; they are distinctly obliquely truncate, and their punctuation is distinctly in rows, almost striate. I cannot discover any trace of the small tooth on the hind tibiæ of this or the preceding species.

Four specimens.

CALLIMERUS DOHERTYANUS, n. sp.

Niger; capite prothoraceque subcæruleis, hoc antice et postice, illo fronte parce albo-squamosis; elytris singulis lituris duabus, una humerum cingente, irregulari, postice interrupta, altera ante apicem, albis, sutura basi metallico-fulvo; antennis, palpis pedibusque pallide testaceis. Long. 8 *millim.*

Hab. Perak (*Doherty*).

CALLIMERUS PICTUS, n. sp.

Niger; antennis, palpis pedibusque testaceis; capitis fronte, prothoracis margine antico et postico, elytrorum basi, punctis duobus lateralibus, gutta suturali, cum macula basali plerumque connexa, fascia subapicali apiceque albo-squamosis. Prothoracis disco obsolete, haud profunde, lateribus rugose, elytris fortiter irregulariter punctatis. Long. 8 *millim.*

Hab. Assam, Patkai Mountains (*Doherty*).

The head in both this and the following species (*C. albosparsus*) is wider than the thorax, the eyes being large and prominent; it is very finely punctured at the base, and finely wrinkled longitudinally near the eyes in both. The thorax is rather suddenly widened below the anterior constriction, and then compressed before the base, the margin of which is distinctly reflexed. The elytra are thickly and deeply punctate, but there is no sign of series or striation; they are very obsoletely costate, and obliquely truncate. The usual lateral parts beneath are covered with white scales.

Two specimens.

CALLIMERUS ALBOSPARSUS, n. sp.

C. picto *affinis, statura et elytrorum pictura similis; nitidior, niger, antennis, palpis pedibusque testaceis, prothoracis elytror-*

umque pictura ut in C. picto, *attamen paulo latius disposita, et fascia subapicali e maculis duabus oblique positis, interiore majore et basi propiore formata. Long.* 8 *millim.*

Hab. India, Manipur (*Doherty*).

The points which chiefly distinguish this species from *C. pictus* are its rather smaller size, the head and thorax, the latter especially, more sparsely and more distinctly punctured, and hence more shining. The punctures of the elytra exhibit a little serial arrangement in the middle. The apices are very distinctly truncate, a small mucro being present at the exterior angle. The pattern of the elytra, though very similar, presents a specific difference, and gives the appearance of consisting of three sutural rather large spots,—one basal, the second not united with it, but sometimes united by a few scales to the third (which is the interior spot of the oblique subapical fascia),—three lateral spots (the first two corresponding to those in *C. pictus*, and the third usually but not always united with the third sutural one), and an apical spot.

Four examples from Manipur agree so closely in possessing these differences, that I think this is more than a local form of *C. pictus*.

In both these species the small tooth near the apex of the hinder tibiæ is present.

CALLIMERUS BENEDICTUS, n. sp.

Niger, nitidus ; antennis, palpis pedibusque testaceis ; capitis fronte densissime, prothoracis basi parce, elytrorum basi tenuiter, puncto, suturali fasciisque duabus subarcuatis, nec suturam nec marginem attingentibus, apiceque albo-squamosis ; capitis basi parcissime, prothorace fortiter fere grosse, elytris fortiter profunde seriatim punctatis. Long. 8·5 *millim.*

Hab. Assam (*Doherty*).

The thorax in this species is longer than in *C. pictus* and its allies, and hence does not appear so much widened in front ; it is much more coarsely punctured, and in the three specimens before me has only a few white scales in the fossa on the sides formed by their compression behind the middle. The scales are of course liable to be worn off ; the head in one of the specimens is so densely clothed in front that the whole of that part is white and shining as if painted, while in the other two they are sparser. The elytra are black and shining, with about five rows of large punctures on each, the punctures, however, becoming confused towards the apex and at the sides, they would form in all eight series ; in one specimen they are inclined to be pitchy brown at the base. The white markings are very much reduced ; besides the usual basal scales there are three spots on each elytron, two of which are placed along the suture, the third a little higher than the second sutural one, so forming (if united) an arcuate fascia, then a curved oblique fascia, and an apical spot (sometimes wanting). Hind thighs toothed. Apex subtruncate.

CALLIMERUS ARCUATUS, n. sp.

Niger; palpis (apicibus exceptis) pedibusque basi obscure testaceis; capite, prothorace elytrisque apicibus cinereo-tomentosis; scutello, elytrorum basi, linea obliqua cum hoc conjuncta, fascia intus abbreviata, arcua communi, et fascia subapicali recta albo-squamosis; elytris basi fortiter, lateribus et versus apicem crebrius minus fortiter punctatis. Long. 9 millim.

Hab. Burmah, Karen Mountains (*Doherty*).

The head and thorax in this species are almost entirely covered with ashy-grey close hairs, resembling scales, and perhaps in part really these are scales; the thorax is very even, scarcely constricted in front, and with the posterior part very gently rounded to the base, the margin is there raised and polished in the middle, and there is a small denuded mark in the centre of the base, before the margin slightly impressed. It is half as long again as wide. The pattern of the elytra is very elegant, but hard to express in words. The basal scales and first oblique mark form an *x*, with the top straight, then almost united to this is a mark like —∪—, the ∪ being common to the two elytra; then a straight and entire fascia at about one third from the apex, slightly thickened on the suture, and the apex itself ashy, and the ashy scales joining the fascia. Legs black, except the trochanters and extreme base of the thighs.

Four specimens.

CALLIMERUS HYDNOCEROIDES, n. sp.

Nigro-cæruleus, nitidus; ore, antennis, palpis pedibusque testaceis; elytris nigris, dimidio basali intus aureo-testaceo, sutura postice punctisque nonnullis albo-squamosis; capite prothoraceque parce et profunde, elytris obsoletius crebre punctatis. Long. 8·5–9 millim.

Hab. Burmah, Ruby Mines (*Doherty*).

Head blue-black, with white scales in front, very sparingly punctured and shining; thorax strongly constricted, and widely lobed at the sides, an impression on each lobe, and one in the middle of the base which is smooth and polished; there are a few white scales on each side in the anterior constriction, the colour is blue-black, the punctuation strong and distinct. The elytra are depressed at their base, black or brownish, this colour extending up the margin to the base, but of a sordid yellow within (the suture narrowly dark) and almost to their apices. The white scales border the suture sometimes in the apical half. In the basal half there are normally six white spots, four in pairs near the suture and between them, one nearer the margin on each elytron on the black part, and there is one lateral subapical spot, sometimes joined with the sutural scales, forming the 7 mark so common in this genus. But these spots are feebly scaled and liable to be worn off, and the central pair may be absorbed in the sutural line. Scutellum white. The hind thighs have the small tooth near their apices. The underside is blue-black, with the

usual lateral white scales. The wide head, lobed sides of the thorax, and form of the elytra, depressed at the base and narrowing to their apex, give this species much the appearance of a large *Hydnocera*.

XENORTHRIUS, Gorham (Ann. del Mus. Civ. Gen. xii. p. 733, 1892).

Xenorthrius is proposed by me, in my descriptions of the Cleridæ collected by L. Fea in Burmah, for a genus of that family of which I have long had a few exponents obtained by Wallace in the East. They are allied to *Opilo* and to my genus *Orthrius*; from the former the conical apical joint of the maxillary palpi, from the latter the eyes distinctly cut out afford sufficient distinction. *X. mouhoti*, from Laos and Burmah, the type of the genus, *X. subfasciatus*, from Pegu, and *X. balteatus*, Burmah, described in the publication quoted, have the elytra entire; I have now to add two species of this section, and one in which the elytra are truncate with a distinct mucro, the genus thus resembling *Priocera*.

XENORTHRIUS EPHIPPIATUS, n. sp.

Pallide piceo-brunneus, breviter dense brunneo-pilosus; palpis, pedibus, elytrorum fascia communi undata ad suturam latiore apiceque pallide flavis; prothorace antice et lateraliter vix punctato, disco postice obsolete, crebre subrugose, elytris basi et lateribus granulose punctatis, fascia et apice sublævibus. Long. 8–9 *millim.*

Hab. Assam, Patkai Mountains (*Doherty*).

The general colour of this insect is pitchy brown, the elytral fascia and the apex being very pale, almost white, and the brown of the parts margining these is more suffused indeterminately; the puncturing is similar to that of *X. mouhoti*, viz. the head is nearly smooth, as well as the front part and rather tumid sides of the thorax; these parts are separated from the disk by the anterior constriction and an impressed line on each side, and the disk is thickly, not deeply or strongly, punctured: as this structure seems usual in the genus, it will not be referred to again except where modified in other species. The elytra have also a normal sculpture, viz. striæ with rasp-like puncturing, the interstices being flattened in the middle and from thence on each side of the suture to the apex, and the punctures obliterated. The punctures are only distinct in the basal third; they become obsolete and only leave small rasp-like edges behind, and in that part the alternate interstices are raised lines, hardly amounting to costæ.

Three specimens.

XENORTHRIUS GENICULATUS, n. sp.

Brunneus; pedibus pallidioribus, geniculis nigris, tarsis brunneis, capite prothoraceque nitidis, hoc disco crebre obsoletius punctato;

elytris obsolete punctato-striatis, striis dorso obliteratis. Long. 13–16 *millim.*

Hab. Manipur (*Doherty*).

The larger size and plain brown colour will distinguish this species from any other yet described. The antennæ are long and thin, the three last joints hardly wider than those preceding them; the head and thorax smooth and shining, with the punctuation very fine; the anterior constriction very plain on the sides, and a fovea on each side below it. The elytra are very plain; though the usual sculpture is present it is all reduced, the flat sutural smooth space being but little emphasized. The legs are paler, with the knees just tipped with black. Although plain this is a fine species, reminding one of certain *Cymatodĕræ*.

Five specimens.

XENORTHRIUS WALLACEI, n. sp.

Nigro-piceus; antennis, palpis, pedibusque basi testaceis, elytris pallide variegatis, prothorace inæquali, nitidiore vage punctulato, basi in medio tuberculo parvo, elytris basi et lateraliter subrugose punctato-striatis. Long. 8·5 *millim.*

Hab. Borneo, Sarawak (*Wallace*).

Nearly allied to *X. ephippiatus* and differing from it as follows: the colour is darker, the thorax is more shining and more uneven and its disk less thickly and more vaguely punctured, on each side of a basal median tubercle are two sulci, thus making three raised tumid spaces; the elytra are more coarsely punctured and the yellow markings not so clearly defined, the apical one being an undulate fascia, and the apex being dark, like the rest of the ground-colour.

One specimen.

I have had this insect for many years and have never been able satisfactorily to classify it. It was unknown to the late M. Chevrolat, to whom I sent it.

XENORTHRIUS TRUNCATUS, n. sp.

Rufo-piceus, nitidus; pedibus et fascia elytrorum haud bene discreta pallidioribus, elytris truncatis et mucronatis. Long. 12 *millim.*

Hab. Assam, Patkai Mountains (*Doherty*).

This species is longer though not much wider than the largest specimen of *X. ephippiatus*; the antennæ are much longer, all the joints, and especially the three terminal ones, being longer; the thorax is more shining, the posterior part more sparingly and obsoletely punctured. The elytra have the flattened space not so wide, the third row of punctures persisting further towards the apex; their fascia is not so well marked nor so white, being very little paler than the ground-colour. The apex is cleanly cut out in an arcuate way, with a distinct mucro at the outer angle of this excision. The legs are long, pale, with the knees and tarsi a little darker.

One example.

ORTHRIUS, Gorham (Cist. Ent. 1876, p. 74).

Orthrius was proposed by me for an Australian species (*O. cylindricus*), a smooth cylindrical insect with only the labial palpi hatchet-shaped at the tip, and the eyes coarse, scarcely cut out. I have since then recognized that many Eastern species placed in various genera should be united with it, though not often so cylindrical. *Clerus subfasciatus*, Westwood, *Thanasimus sellatus*, Westwood, *Opilo sinensis*, Gorh., and probably some others cannot be retained in those genera, but will form a homogeneous group under this name.

ORTHRIUS BRACHIALIS, n. sp.

O. tarsali, *Gorh.*, *affinis et summa similitudine, ferrugineus, nitidus, tibiis geniculisque nigris, elytris substriatis perobsolete punctatis. Long.* 10 *millim.*

Hab. Assam, Sudiya, Naga Hills, Patkai Mountains (*Doherty*).

Very closely allied to *O. tarsalis*, described by me in the 'Annals' of the Genoa Museum of Natural History for 1892, a species from Burmah, and only differing from it in having merely the tips of the femora and the tibiæ black, whereas in *O. tarsalis* the femora and breast are also black.

The striation and punctuation of the elytra are a little more distinct. The specimen from the Nagas has the antennæ a little more infuscate, and in both it and the other specimens the tarsi have their uppersides dark. A single example from Patkai is not well developed and has the tibiæ red, being, in fact, ferruginous all over, but does not, I think, represent another species.

The femora in this species and its allies are subincrassate, especially the front pair.

THANASIMUS CARBONARIUS, n. sp.

Ater; antennarum articulo ultimo, femorumque basi albo-testaceis, prothorace tuberculoso-inæquali, elytris basi granulatis tuberculisque nonnullis seriatim instructis, dimidio apicali sublævi, versus apicem fascia argenteo-pubescente ad suturam interrupta. Long. 8 *millim.*

Hab. Manipur (*Doherty*).

Coal-black, a little shining; eyes finely granulated, deeply and angularly excised; antennæ longer than the head and thorax, dull and pubescent, compressed, the three basal joints pitchy, the apical joint acuminate, nearly white, and the one preceding pale, the second joint very short, the third as long as the two basal joints, those following gradually increasing in width, not serrate. The thorax longer than wide, very rugose and uneven, having several tubercles, one of which before the middle of the base is round and shining. Elytra not much wider than the thorax, their basal third very rough, with two rows of elongate sharp tubercles on each, very irregular and often coalescing, the apex smooth, with an oblique fascia-like band of silvery hairs at about a quarter from the apex; a few scattered hairs are found all over the elytra,

the apex is subpubescent, but smooth and shining. The mesosternum is strongly punctured; metasternum and episterna clothed with short pubescence, but very thinly. Abdomen shining. The palpi are pitchy, the maxillary ones paler at their tips, which are sharply acuminate.

I have some doubts as to what genus this insect is best placed in. *Thanasimus*, as it now stands, is a complete magazine. Comparing this insect with *T. formicarius*, the antennæ are rather long, and are in the middle wider and flatter, the apical joint rather larger and less cultriform; the head, trophi, eyes, thorax, form of the elytra, &c. agree fairly well; the femora and tarsi appear to me also to agree sufficiently well.

Two specimens were obtained.

NEOHYDNUS, Gorham (Ann. Mus. Civ. Gen. ser. 2, xii. 1892, p. 742).

NEOHYDNUS BASALIS, n. sp.

Niger; elytris basi, pedibus basi, tibiarum apicibus tarsisque, ore, antennis, palpisque testaceis, prothorace postice fortiter contracto, antice transversim constricto, elytris creberrime et confluenter punctatis. Long. 3 *millim.*

Hab. Assam, Patkai Mountains (*Doherty*).

The head in this little species is wider than the thorax and thickly clothed with silvery shining hairs; the eyes are large and oval and finely faceted, with numerous setose hairs; the antennæ are very short, reaching scarcely to the middle of the eyes, almost white. The thorax is wide in front, with a deeply impressed transverse line just behind the front margin, the sides strongly lobed immediately behind this line; the lobes with a small fossa on each, then much contracted to the constricted base. The elytra are about the same width as the head, parallel, almost variolose, the small callus, and a variable spot nearer the scutellum, often the whole base, is indeterminately white; the rest dull black, thickly clothed with short shining hairs. The legs are rather variable; the tibiæ except at the apex, the femora except at the bases, are dark pitchy; but the hind femora are sometimes quite testaceous, the tarsi are short. This species differs from *N. despectus* in the form of the thorax and with the following species will probably ultimately be separated generically; at present the points of resemblance—the structure of the antennæ and head—justify its association with it.

Several specimens.

NEOHYDNUS RELUCENS, n. sp.

Niger, nitidus; pedibus basi tibiisque apicibus testaceis; prothorace postice valde contracto, brevi; elytris profunde ac distincte punctatis, pube brevi pruinosa relucente. Long. 4 *millim.*

Hab. Siam, Renong (*Doherty*).

Allied to *N. basalis*, but larger and broader, the thorax not so

suddenly contracted, with a *double* fossa in each lobe; the elytra more distinctly punctured, but the punctures often confluent transversely, no trace of a pale mark, and their tips smooth; the legs more widely black and the tarsi brown.

One specimen.

NEOHYDNUS CINERASCENS, n. sp.

Niger, subnitidus; tibiarum apicibus tarsisque testaceis; antennis palpisque brunneis; prothorace postice angustato, antice, haud profunde, constricto, basi transversim impresso, disco perobsolete punctato; elytris crebre, distincte, confluenter punctatis, fascia cinerea e pube formata haud bene discreta. Long. 3–4 *millim.*

Hab. Tenasserim, Tavoy (*Doherty*).

The thorax in this species is rather longer than in *N. basalis* and with the head is more shining; it shows evident but very obsolete traces of punctuation. The sides are not clearly lobed; they have indistinct oblique impressions, but these and the constricted lines are not well defined. The hairs composing the fascia on the elytra are so small as not easily to be seen separately, but are very bright and reflect silvery light (reminding one of the fascia in *Clerus mollisfascia* and some South-American *Hydnoceras*).

A small series of specimens were obtained.

NEOHYDNUS LUGUBRIS, n. sp.

Niger, nitidus; antennarum articulis duobus primis, tibiarum apicibus intermediis et posticis testaceis; prothorace postice contracto, lobis lateralibus impressis, disco nitido; elytris crebre distincte punctatis. Long. 4·5 *millim.*

Hab. Manipur (*Doherty*).

Very nearly the same size and form as *N. cinerascens*; black, with the exception of the two basal joints of the antennæ and the other parts of the mouth, which are, however, obscure, and the tips of the four hinder tibiæ; the tarsi are obscurely pallid. In one specimen there is on each elytron near the apex a depressed flat oval areolet, which seems to be clothed with brown hairs: I am not able to say whether this may not be an accidental character; I do not think it is sexual.

NEOHYDNUS SORDIDUS, n. sp.

Piceo-brunneus vel piceus; ore, palpis, pedibus elytrorumque plagia communi suturali testaceis. Long. 4–5 *millim.*

Hab. Tenasserim, Tavoy (*Doherty*).

This is evidently a variable species in colour; in all the examples I have seen the elytra are brownish yellow along the suture, this colour widening out at the base, and at the apex shading off into the blacker tint of the margins. The thorax, puncturing, and other characters are generally those of *N. cinerascens*.

PELONIUM (?) NIGRO-ÆNEUM, n. sp.

Nigrum, superne æneo-nitens; capite prothoraceque crebre subtiliter punctatis, nitidis; elytris quam prothorax duplo latioribus creberrime inæqualiter punctatis, punctis ubique confluentibus, pube grisea tenui dense vestitis; abdominis apice pallescente, antennarum articulo primo subtus testaceo. Long. 7–12 *millim.*

Hab. Assam, Patkai Mountains (*Doherty*).

Antennæ with the basal joint stout, slightly curved; second joint short, bead-shaped; third elongate, compressed; fourth to eighth gradually shorter, the seventh and eighth being transverse, the latter especially being very short and smaller than the seventh; the ninth and tenth joints large, triangular, subequal, the apical one more oval; the palpi have their apical joints oblong and truncate, wider than the preceding joints, in both pairs. The eyes are reniform, moderately strongly faceted, deeply excised, with a short ridge, beneath which the antennæ take their origin. The thorax has the sides evenly rounded; it is a little more narrowed in front than behind, the constrictions are obsolete; it, as well as the head, legs, and sides of the elytra, has a rather long but fine grey pubescence. The punctuation of the elytra is thick and irregular; the punctures are broken, *i. e.* the larger ones seem formed of groups of confluent smaller ones; towards the apex the larger pits gradually disappear. The legs are black, but not deeply so, the body beneath and the trochanters tending to be pitchy.

Three specimens were obtained by Doherty, one much smaller than the other two, and having the last three joints of the antennæ much longer and thinner than in those examples.

SISYRNOPHORUS.

Sisyrnophorus, C. Waterhouse, Ent. Mo. Mag. xiii. (1876) p. 125.

This singular genus was detected by myself among the Coccinellidæ at the British Museum—the typical species, *S. maculatus*, at first sight roughly resembling some species of that family. Two species were characterized by the author—*S. maculatus* from the Philippine Islands and *S. bowringii* from Penang. I do not at present see that there was sufficient ground for separating it from *Allochotes*, Westwood, Trans. Ent. Soc. 1875, p. 241. But anyhow that name appears too close to *Allocotus* (Fieber), Puton (Hemiptera), Ent. Mo. Mag. xi. p. 146 (1874).

Westwood describes (*loc. cit.*) seven species.

Choresine, Pascoe, to which he compares the genus, belongs to the Melyridæ.

SISYRNOPHORUS BIRMANICUS, n. sp.

Læte ferrugineus; elytris metallico-viridibus, nitidis, crebre subtiliter punctatis. Long. 8 *millim.*

Hab. Burmah, Ruby Mines (*Doherty*).

Head and thorax rich rusty—almost blood—red, very finely,

scarcely visibly punctate, with a very fine and short blackish pile. Antennæ paler than the thorax, but the legs and body beneath entirely of the same colour as they are; the scutellum also red. The thorax has the base finely margined, the sides are quite merged in the same curve as the base. The elytra are brilliant, of a dark metallic green, evenly punctured, with very fine and very short blackish pubescence.

This insect appears to be allied to *Allochotes bicolor*, Westw.; it seems to differ from it in being larger, in the antennæ being inserted closer to the eyes (in Westwood's figure, t. ix. f. 1 *a*, they are shown as inserted well *in front* of the excision), in the thorax not being "fulvo-setosus," and in the elytra not being "nigro-viridia."

Two specimens.

SISYRNOPHORUS CHRYSOMELINUS.

Allochotes chrysomelina, Westw. Ent. Mo. Mag. xiii. p. 242.

A single specimen from the Ruby Mines, Burmah, may pertain to this New-Guinea species, but it seems hardly likely that it would; but the brief diagnosis, six words, in addition to the size, 2½ lines, apply quite well to it, as they might to many other species. We cannot be always going to Oxford to see types.

SISYRNOPHORUS FRYI.

Niger, densius subpruinoso-pubescens; capite, antennis, pedibus (femoribus prætermissis), prothoracis basi, elytrorumque fasciis duabus, externe abbreviatis, posteriore lato, fulvis; elytris creberrime et subtilissime punctatis. Long. 6·5 *millim.*

Hab. Burmah, Ruby Mines (*Doherty*).

Head entirely pale rusty red, shining; eyes not large; the antennæ as long as the head and thorax, the third and fourth joints elongate, the fifth to the tenth quadrate but gradually shortening, the apical joint short.

TENERUS DOHERTYANUS, n. sp.

T. chalybæo *proximus et valde affinis; cyaneus, nitidus; palpis ad basin, epistomate punctoque capitis flavis, antennis nigris, elytris unicostatis. Long.* 7 *millim.*

Hab. Perak (*Doherty*).

This species is so very much like *T. chalybæus*, Gorh. (Trans. Ent. Soc. 1877, p. 405), that it will be sufficient to point out the differences. The elytra appear to be rather longer, and have each a fine costa nearer to the suture than to the shoulder, terminating about a third from the apex. The elytra are even more closely punctured. The presence of a yellow spot on the head recalls a specimen of *T. chalybæus* mentioned (*loc. cit.*).

I have not hitherto had any reason to doubt that costation of the elytra is a specific character in this genus. It is, however, so very difficult to ascertain the sex, that this supposition must be taken with some reserve.

6. On the Dates of the 'Encyclopédie Méthodique' (Zoology).

By C. Davies Sherborn and B. B. Woodward.

[Received June 15, 1893.]

The exact dates of publication of the separate parts of this remarkable Encyclopedia, which first began to appear in 1782, and was not completed until almost the middle of this century, have been a constant source of trouble to zoologists. The most diligent search has failed to bring to light particulars of the original parts and their contents, and only now and then can any such facts be established. For instance, the 50th livraison was published on the 23rd July, 1792, but we are by no means certain of its contents. The following determinations are the results of a search extended over many months, of a careful consideration of the views of others, and of a personal page by page observation by Mr. Sherborn while compiling his 'Index Gen. et Spec.'

In arriving at these conclusions we have been indebted to the writings or communications of the following authors:—Moquin-Tandon, G. Dollfus, H. E. Dresser, A. Newton, R. Bowdler Sharpe, Salvadori, F. H. Waterhouse, Edgar Smith, W. F. Kirby, and others.

We have decided to arrange the 'Encyclopédie' according to the method employed in the General Library of the British Museum (Natural History), as that has been found most convenient.

Considerable confusion has been caused by writers who have treated portions of this book as separate publications and have quoted them as such. We refer to Desmarest's 'Mammalogie,' Bonnaterre's 'Cétologie,' 'Erpétologie,' etc., and Bonnaterre and Vieillot's 'Ornithologie.' In order to avoid such confusion in the future, we would suggest the following as a satisfactory method of quotation:—

A. G. Desmarest, Enc. Méth. (Mamm.) (1), 1820, p. —.
G. P. Deshayes, Enc. Méth. (Vers) ii. (2), 1831, p. —.

The following is the result of our investigations:—

Zoology.—*Text.*

Tom. I. Hist. Nat. des Animaux. By Daubenton, edited from Buffon: pp. i–xcii, 1–230. **1782.**
Ornithologie, by Mauduyt: pp. 231–691. **1782.**

Tom. II. Ornithologie, by Mauduyt: pp. 1–544. **1784.**
Anim. Quad. ovipares, et les Serpens, by Daubenton: pp. 545–712. **1784.**

Tom. III. Poissons, by Daubenton: pp. i–lx, 1–435. **1787.**
[*Note.*—To the "Animaux" and "Oiseaux" no specific names are appended; to the "Quad. ovip.," the "Serpens," and the "Poissons" the genera and species of earlier authors are appended, but no new names are given and precedence is given to the French version.]

Tom. IV. Insectes. Five "discourses préliminaires" (pp. i–cclxxxviii and i–ccclxxiii) by Mauduyt are prefixed: (Guéneau de Montbeillard, who had been entrusted with the work, died before he could carry out his mission). Mauduyt also contributed some of the articles, which he signed. Olivier took up the systematic portion of the work from the beginning (pp. 1–322). **1789.**

Tom. V. Insectes, by Olivier: pp. 1–794. **1790.**

Tom. VI. Insectes, by Olivier: pp. 1–704. **1791.**

Tom. VII. Insectes, by Olivier: pp. 1–828. **1792.**

[*Note.*—"M. Olivier, obligé de s'absenter pendant plusieurs années pour remplir dans le Levant une mission de Gouvernement, reprend ici la rédaction de ce Dictionnaire, qui avoit été confiée à d'autres personnes depuis la lettre L." That is to say, from vol. vii. p. 601 to vol. viii. p. 45 (on which page is the note quoted). As B. E. Manuel signed the last page of vol. vii. and the article so signed was not completed, it is probable that he was the chief person to whom the work was entrusted.]

Tom. VIII. Insectes. By Olivier [and Latreille]: pp. 1–722.
Pt. 1, pp. 1–464. **1811.**
Pt. 2, pp. 465–722. [? **1814**[1].]

[*Note.*—On p. 468 we find the following:—"Nous avons engagé M. Latreille, . . . à se charger dorénavant de quelques articles qui seront souscrits des trois premières lettres de son nom."]

Tom. IX. Insectes, by Latreille and Godart.
Pt. 1, pp. 1–328. **1819.**
Pt. 2, pp. 329–828. [? **1823** or **1824**.]

[Mr. W. F. Kirby possesses copies of these 2 parts as issued: the second is undated[2]. In vol. 2 of "Musique"[3] an advertisement states that the 87th livr. by Latreille was about to appear [1818] and would contain "Papillons"; this part was, however, written by Godart (see preface to vol. ix.).]

Tom. X. Insectes, by Latreille, Le Peletier de St.-Fargeau, Serville, and Guérin [-Ménéville]: pp. 1–832. **1825.**

Histoire Naturelle des Vers. By Bruguière.
Tom. i. pt. 1, pp. 1–344. **1789.**
„ pt. 2, pp. 345–758. **1792.**

Ibid. Tom. ii. By Bruguière, Lamarck, and Deshayes.
Pt. 1, pp. 1–256. **1830.**
Pt. 2, pp. 1–594. **1831.**

[*Note.*—Bruguière and Lamarck had nothing whatever to do with this volume; it was entirely by Deshayes, except the article CONUS, which was written by Hwass.]

Ibid. Tom. iii. By Deshayes: pp. 595–1152. **1832.**

[1] Quoted by Lamarck in his Anim. s. Vert. vol. iii., which was published in August 1816.
[2] Quoy & Gaimard in Freycinet, Voyage Uranie, etc., 1824, quote pt. 2.
[3] British Museum (Nat. Hist.), General Library.

Edentates alone excepted) either abuts against or is confluent with the scapular element, and its acromion when differentiated[1]. It is thus seen that the same term has been applied to a localized outgrowth of the coracoid element most variable in its differentiation, and to a distinct element of invariable relationships. The different usages of the term epicoracoid have been productive of a precisely similar confusion, as I have elsewhere pointed out[2]. If, as is most desirable in the progress of anatomical science, distinct substantive names are to be applied to distinct structures, the terms precoracoid and coracoid must in the future be used to distinguish a portion of the ventral half of the shoulder-girdle which is from one which is not related to the clavicle. Upon this principle the term epicoracoid can only apply to the Mammalia, and those Anomodontia[3] in which the coracoid is segmented into two perfectly distinct parts which ossify independently.

In commenting upon my proposal to restrict the term epicoracoid to the element so named by Cuvier in the Monotremes and its serial homologue, and the term precoracoid to the cartilaginous clavicular bar and its representative, Mr. Lydekker remarks that "this emendation, if properly authenticated," he would have been willing to accept. I presume that by "properly authenticated" he means tenable upon the accepted rules of priority in nomenclature? If so, I would ask what would be the outcome of the application of these, with their rigid restrictions, to the terminology of, say, the elements of the carpus and tarsus, or the muscles of the limbs, so variable in both their characters and detailed relationships? Confusion worse confounded, 'progress' but not scientific advancement, would, I venture to think, ensue.

Having proposed to reject the term epicoracoid, and to restrict the term coracoid to the element thus left nameless, Mr. Lydekker suggests the term 'metacoracoid' for the Cuvierian coracoid of Monotremes, and the 'coracoid epiphysis' of the higher mammals which I have claimed as its homologue. I would no less gladly accept his proposals than he would my own, but for the following very grave consideration. The observations of Goette and others leave no doubt that the coracoid and epicoracoid of the Mammal on the one hand, and the single so-called coracoid of the Amphibia, living Reptilia, and Birds, on the other, are derivatives of that

[1] It is interesting to note that *Bradypus tridactylus*, in the adult of which the clavicle is *par excellence* attached to the coracoid, is the very mammal in the young of which Hoffmann has detected the primary continuity between the precoracoid and acromion. (Niederl. Arch. f. Zool. Bd. v. p. 37.)

[2] *Loc. cit.* pp. 196, 197.

[3] With the possible exception of the Ichthyosauria and Nothosauria, in accordance with Seeley's recent observations. My friends in the Natural History Museum have accorded me the privilege of examining Prof. Seeley's specimens, and I entirely agree that an unossified ventro-dorsal continuation of the Ichthyosaurian coracoid was present in the region in which he believes it to have been. It seems to me, however, that the notion that a separate (distinctly segmented) epicoracoid existed must remain in abeyance, until at least its impress shall have been discovered in the matrix.

portion of the coracoidal skeleton not involved in the clavicular apparatus, and to its homologue the term coracoid is applied in all the lower Vertebrata, whether it be ossified or not. What, then, are we to term this, if Mr. Lydekker's system is to endure? The context of his paper suggests coracoido-metacoracoid as a likely term; but before that could be introduced it ought to be shown that the single 'coracoid' of living Lizards, which is coincident in area with the conjoint coracoidal elements of Anomodonts and Mammals, is the product of fusion of these. No one has yet demonstrated the remotest trace of more than a single centre of ossification in the Lacertilian coracoid; while, on the other hand, its double ossification in the Mammalia, in its non-abbreviated form (*Ornithorhynchus*), is preceded by its segmentation while still cartilaginous. Mr. Lydekker's proposals might perhaps be accepted were the Mammalia and Anomodontia alone concerned. Anatomical terminology, however, unlike nomenclature in systematics, must needs be applicable to all classes of this or that sub-kingdom; and it has therefore to cover a very wide range of structural variation. These considerations, together with those which I have already raised, appear to me fatal to the acceptation of Mr. Lydekker's terms, which seem no more tenable than the application of the human anatomists' term 'scapula' to the coraco-scapular 'blade-bone,' into which he lapses in his final footnote on p. 174, and which, on grounds of sheer priority, should be adhered to. We are dealing with a common (*coracoidal*) cartilage, which is in some animals replaced by a couple of osseous elements, and in others by but one. Setting aside the precoracoid and clavicle, the ultimate homologies of which are by no means yet fully worked out, our present requirements may be met by the retention of the universal term *coracoid* for the entire set of structures (*i.e.* the cartilaginous 'coracoid' bar and its derivatives), with the introduction of, say, the terms *unicoracoidal* and *bicoracoidal* for its diversely modified types, and the retention of Cuvier's *epicoracoid* for its anterior and Lydekker's *metacoracoid* for its posterior segment in the latter one. Upon this basis, the sum of our knowledge of the coracoid of Amphibia and Amniota may be formulated as follows:—

Coracoid.

i. *unicoracoidal.* Amphibia, all living Reptilia, Aves.
ii. *bicoracoidal.* Some Anomodontia, Mammalia, Ichthyosauria and Nothosauria (?).

A simple alternative would be the description of the common coracoid as either uni- or bi-segmented; but this, for obvious reasons, would be insufficient. The arrangement which I here propose admits of the retention of the human anatomists' term 'coracoid process' as all-sufficient for the requirements of the systematic mammalogist, who, except for his concern with the Monotremes, deals with the vexed element only in its most abbreviated and vestigial conditions.

II. *As to the Mammalian Coracoid.*

A leading feature in Mr. Lydekker's paper is the presumed demonstration that in *Bradypus* the "so-called epicoracoid enters to a small extent into the formation of the glenoid cavity." He urges this, in forcible opposition to an assertion of my own that "the exclusion of this element from the glenoid facet is one of its most characteristic features;" and from the context of his paper the reader would be prone to conclude that I had laid this down as a condition characteristic of all Mammals. In my original paper, to which the assertion he transcribes is but a casual allusion, I expressly stated[1] that in the higher Placentalia the so-called epicoracoid "comes to enter into the formation of the glenoid facet in proportion as the coracoid bar is suppressed," adding that "the latter structure retires from the scene as the 'coracoid epiphysis' of human anatomists."

Mr. Lydekker asserts that in both the Dicynodont and the Bradypodine the "so-called epicoracoid enters to a small extent into the formation of the glenoid cavity;" but while his figure of the former depicts it as contributing an altogether insignificant share in the cavity, that of the latter represents it as contributing wellnigh one linear half of it. There is an incongruity here; and in proceeding to deal with it I incorporate some observations upon the Mammalian coracoid which have accrued since my former paper was written.

My friend Mr. Oldfield Thomas has generously allowed me to examine the material which passed through Mr. Lydekker's hands. The latter gentleman infers that the coracoid of Sloths consists of but one element (his so-called coracoid, *Co'*, see figs. 1 *d*, 1 *e*), therein implying that that element which I have claimed as the homologue of the Monotreme's coracoid (his metacoracoid) is in them absent.

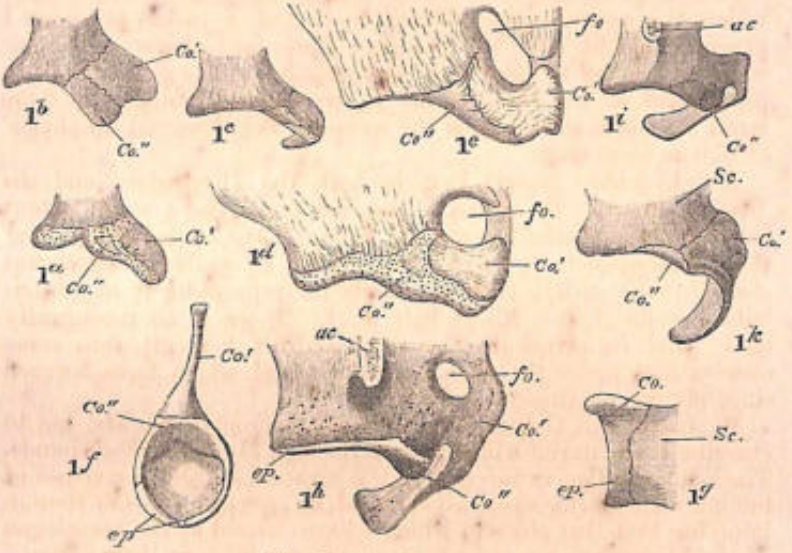
There is in our National Collection a blade-bone of *Cholœpus didactylus* (fig. 1 *e*) in which both coracoidal elements are well represented; and it will be noted that the epicoracoid (*Co'*) is completely excluded from any share in the glenoid facet, like that of both the Monotreme and the Rabbit, on comparison of which I originally sought to reduce the pectoral girdle of all Mammals to a uniform plan of structure. I find the metacoracoid (*Co''*), which effects this exclusion, represented in a very young *Bradypus cuculliger* by a feebly constituted fragment of bone (*Co''*, fig. 1 *d*) wedged in between the epicoracoid and scapula. The epicoracoid in this specimen is remote from the actual glenoid border, there being present at this period of growth a considerable tract of cartilage (the dotted area of fig. 1 *d*), into which the epi- and meta-coracoidal centres are alike free to extend.

The condition of this specimen is very nearly that of the Rabbit (fig. 1 *a*) when first the metacoracoid (*Co''*) appears. The period of independent duration of this bone is, in the Placentalia,

[1] Journ. Anat. & Phys. vol. xxi. p. 193.

exceedingly brief (from two to three weeks in *Lepus*); it arises late, extends rapidly, and first ankyloses, no less summarily, with either the scapula or epicoracoid. It is therefore a difficult structure to detect, unless we examine a large series of specimens of all ages. In view of these facts, the further study of the Bradypodine girdle can alone show what is the actual share of the coracoid centres in the adult glenoid cavity of that animal; but, be the outcome of this what

Fig. 1.



The Coracoid Apparatus.

1 *a*. *Lepus*, one month after birth; 1 *b*. *Lepus*, 7 weeks, both × 1½. 1 *c*. *Sciurus vulgaris*, juv.; 1 *d*. *Bradypus cuculliger*, juv., both × 2. 1 *e*. *Choloepus didactylus*, half-grown, nat. size. 1 *f*. *Tamandua tetradactyla*, front view, adult, × 1½. 1 *g*. *Tatusia novemcincta*, inner aspect, × 1½. 1 *h*. *Ateles marginatus*, × 1½. 1 *i*. *Cebus* sp., × 1½. 1 *k*. *Homo*, 14–15 years, modified from Sabatier, ½ nat. size.

ac. Acromion. *Co'*. Epicoracoid. *Co''*, Metacoracoid. *Sc*. Scapula. *ep*. Scapular epiphysis. *fo*. Coraco-scapular foramen.

it may, the condition of the Choloepine girdle (as here figured) shows that the interpretation of Lydekker cannot hold good for the Sloths as a series. In justice to myself, I am therefore compelled to add that, so far as the point immediately at issue is concerned, the ground traversed by Mr. Lydekker has been already covered in my earlier communication, and I regret that in my later one, which he cites, I did not add, after the words "most characteristic features," at any rate in its non-reduced form.

I have observed the existence of a distinct metacoracoid in the

young of members of six orders of Placental Mammals (see the list given below). I give figures of some of my specimens, and it will be noticed that there is evidence of independent parallelism of reduction of the bone named. The conditions suggest that the differences between the *Cholœpus* and *Bradypus* figured may be akin to those between *Cebus* and *Homo*, *Lepus* and *Sciurus*, and that the Edentata may be on a variational equality with other orders in respect to the reduction in question.

To turn finally to the well-known overgrowth of the Edentate epicoracoid and scapula, for enclosure of the so-called coraco-scapular foramen. Lydekker merely alludes to the similarity in this respect between the Edentates and Dicynodonts. So far as I am aware, this peculiarity is invariable only in certain Edentata and Cebidæ[1], among living Mammals, and a similar condition is well known to occasionally occur in Man. Prof. Bland Sutton has instituted comparisons[2] between the human blade-bone thus modified and that of the Sloth, and in so doing he has remarked[3] "I am disposed to the view that the transverse ligament in Man is the fibrous representative of this bony bridge constant in Sloths, and that the occasional occurrence of a complete osseous foramen in this situation is not to be regarded as an ossification of the transverse ligament, but as a reversion to a former condition." The known facts of morphology lend no support whatever to this view. Were it tenable, the embryonic scapula of Man should bear an expanded if not an actually perforated prescapular lamina, which it does not[4]. The entire absence of the prescapular lamina in the Monotremes and Anomodontia, and the fact of its known increase of expansion during development in Man and in some few other Placentalia, go far towards proving that its overgrowth to meet the epicoracoid must be in all cases secondary; and they testify to an independent parallelism of modification in the two great classes of animals. The condition occasionally met with in Man may be closely paralleled by the Tapir among placental quadrupeds.

The Bradypodines are remarkable for the secondary association of the clavicle with the coracoid (see above, p. 586). In the Cholœpines the *apex* of the acromion becomes inwardly rotated, and, together with the clavicle and coracoid, bound up in a dense fibro-cartilaginous mass[5]. In *Cycloturus* the scapula differs from that of all other Edentata but some Armadillos (ex. *Dasypus minutus*) in the inward rotation of its antero-ventral border. As viewed from the front (see fig. 2 *b*, p. 591), this is very conspicuous. I find, on examination, that this peculiarity is associated with the presence of a very powerful ligament (*lg.*) which passes between the *body* of the adult acromion and the scapula, enclosing a foramen above. In

[1] In *Ateles marginatus* (fig. 1 *h*) (not in *A. melanochir*), *Brachyteles*, and *Lagothrix*.

[2] 'Ligaments, their Nature and Morphology.' London, 1887.

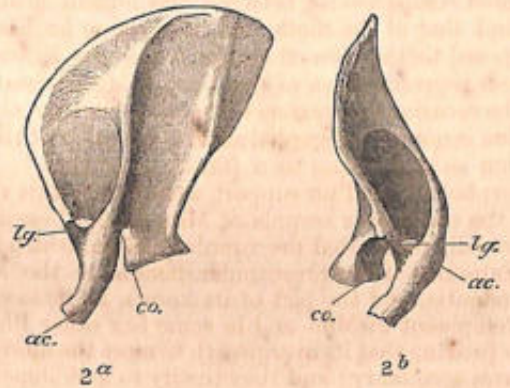
[3] *Op. cit.* p. 6.

[4] *Cf.* Parker's Ray Soc. Monogr. pl. xxx. figs. 9 and 12.

[5] *Cf.* Parker, *op. cit.* pl. xxi. figs. 10 and 22.

my own specimen this ligament is superficially calcified, and the acromion is vertically enlarged at its point of origin, in a manner suggestive of a tendency on the part of this bar to fulfil the function of the overgrown epicoracoid of *Cholœpus*, *Bradypus*, and other genera. In *Cholœpus* the two conditions coexist. I have long desired to work out the detailed anatomy of the Edentate axilla in its bearings on these facts, but the necessary fresh material has not been obtainable. I cannot help thinking, however, that they point to the conclusion that the condition of the coraco-scapular apparatus in *Bradypus* which Mr. Lydekker has described is due to one of a series of adaptive changes which that of the Edentata has undergone in relation to the modification of their fore limb and pronounced peculiarities of life. Certain it

Fig. 2.



The blade-bone of *Cycloturus didactylus*. 2 *a*, from the side; 2 *b*, from the front. × 1½.

ac. Acromion. *co.* Coracoid process. *lg.* Acromio-scapular ligament.

is, that, except for the joint possession of a bicoracoid, the resemblances between the Edentate and Dicynodont blade-bones are indicative of nothing but a parallelism of adaptive change; and it is interesting to meet with this in two great groups of animals the ancestors of which we to-day seek independently among the lower Anomodontia.

I append a list of those Placentalia in which I have observed the metacoracoid, and have much pleasure in tendering my thanks to Mr. Oldfield Thomas, of the Natural History Museum, and to Prof. C. Stewart and Mr. R. H. Burne, of the Royal College of Surgeons, for permission to examine the collections under their charge.

Edentata. *Bradypus cuculliger*, *Myrmecophaga*, *Tamandua tetradactyla*, *Tatusia novemcincta*.—Ungulata. *Cervulus reevesi*, *Equus*.—Rodentia. *Cœlogenys paca*, *Lepus cuniculus*, *L. timidus*,

Sciurus vulgaris.—SIRENIA. *Manatus americanus, Halicore australis*(?)—CARNIVORA VERA. *Arctictis binturong, Cercoleptes caudivolvulus, Felis lynx, Lutra vulgaris, Viverra malaccensis*.—PRIMATES. *Ateles melanochir, A.* sp., *Brachyteles* sp., *Cebus* sp., *Chiromys, Cynocephalus babuin, C. maimon, Homo, Lagothrix* sp., *Lemur macaco, Macacus cynomolgus, M. silenus, Mycetes auratus, Semnopithecus maurus, S. schistaceus*.

I find that one extreme term in the series of modifications to which the Mammalian coracoid is susceptible is reached in the Edentata (*Tamandua*, fig. 1 *f*, and *Tatusia* fig. 1 *g*, p. 589), viz. the complete exclusion of the scapula from the fully-formed glenoid facet, by the fusion and joint extension of the metacoracoid and scapular epiphyses (*Co''* and *ep*., figs. 1 *f*, *g*, *h*). I have only observed this peculiarity in *Ateles marginatus* and *Lutra vulgaris* among the higher forms which I have examined. Its independent assumption in them appears, by analogy, to lend additional support to the belief that the overgrowth of the epicoracoid and scapula to enclose the so-called coraco-scapular foramen (*fo*., figs. 1 *d*, *e*, *h*) is a secondary and independently acquired character.

8. On some new Species of the Land-Molluscan Genus *Alycæus* from the Khasi and Naga Hill Country, Assam, Munipur, and the Ruby Mine District, Upper Burmah; and on one Species from the Nicobars. By Lt.-Col. H. H. GODWIN-AUSTEN, F.R.S., F.Z.S., &c.

[Received June 20, 1893.]

The present paper is to a great extent a continuation of one I read before the Society last year[1] describing the *Diplommatinæ* from the Assam Hill Ranges which Mr. Doherty's excellent collecting had accumulated.

The *Alycæi* now described include those which Mr. Doherty obtained in North Burmah, one species which I discovered myself in Munipur, and another of which examples have lately been sent to me by Colonel Beddome, who received them from Mr. Muspratt, an officer now stationed in the Naga Hill Country. I also take this opportunity to describe a new species of the same genus of which an example, found by Mr. Busby at the Nicobars, was in Dr. Hungerford's fine collection.

In 1871 (J. A. S. B. 1871, pl. iv. fig. 3) I figured an *Alycæus* from the Naga Hills as "*A. ingrami*, var." A comparison of it with typical specimens of *A. ingrami* now shows me that it is quite distinct, and I therefore name it *A. distinctus*. I referred to the same species again in 1874 (J. A. S. B. 1874, p. 150) and gave the many localities where I had subsequently obtained it. I have lately received from Col. Beddome, also from the Naga Hills,

[1] See P. Z. S. 1892, p. 509.

examples of the same shell, which have led me to recompare the two forms.

1. ALYCÆUS BI-RUGOSUS, n. sp.

Locality. Khasi Hills and Munipur (in coll. Godwin-Austen).

Shell globosely turbinate, rather openly umbilicated; sculpture smooth on upper whorls, regular close ribbing on the swell of the last; colour pale ochraceous or ruddy brown; spire conoid, rounded at apex; suture impressed; whorls 4, the last not swollen, contracted in front of the rather short sutural tube, then enlarging again into two parallel ridges, which adjoin the aperture; aperture ovate, angular above and below, rounded on the inner margin.

Operculum pale in colour, smooth in front.

Size: maj. diam. 3·0; alt. axis 1·25 mm.

The specimens were found in the Khasi Hills, but the exact locality is not recorded. One specimen I obtained south of the Barak River on the road from the Naga Hills to Munipur. Although this shell, in size and most of its characters, is like *A. multirugosus*, G.-A., of the Naga Hills, it differs materially, more especially in the form of the aperture and in the ridges on the expanded portion of the last whorl.

2. ALYCÆUS SUBCULMEN, n. sp.

Locality. Naga Hills (*W. Doherty*, in coll. Aldrich).

Shell globosely turbinate, solid, closely perforate; sculpture, smooth on all the upper whorls and polished, close-set ribbing on the swell of the last whorl; colour dark ochraceous; spire conical, apex rounded, blunt; suture impressed; whorls 4, round, the last swollen, contracted at base of a short sutural tube, then rising into a depressed ridge, thence expanding and spreading to the aperture; aperture circular, subvertical; peristome double, much thickened, simple, continuous.

Size: maj. diam. 2·75; alt. axis 1·5 mm.

This is a very distinct species; in the solid rounded peristome it approaches *A. conicus* from Jaintia and *A. vestitis* from the Arakan Hills.

3. ALYCÆUS (DIORYX) GRANUM, n. sp.

Locality. Margarita, foot of Eastern Naga Hills (*W. Doherty*, in coll. Aldrich).

Shell perforate, globose; sculpture fine regular ribbing, closely arranged and extending to the peristome; colour ruddy ochre; spire subconical; suture well impressed; whorls 4, rounded, a slight constriction in front of the short sutural tube; aperture suboblique, circular; peristome double, the outer reflected slightly.

Size: maj. diam. 2·25; alt. axis 2·0 mm.

This species is only half the size of its nearest ally, a variety of

A. otiphorus from the wooded slopes of the North Jaintia Hills. This variety was figured and described by me in the J. A. S. B. 1871 (p. 93, pl. v. fig. 6). From Mr. Aldrich I have received three specimens of it all fully grown, and as it is so much smaller than the typical *A. otiphorus* from Sikkim (which is as much as 4·25 mm. in maj. diam.), I consider it necessary to give it a distinct title. It is also more depressed and has fewer whorls, and the umbilical area is more open than in the Darjiling form. The form of the Jaintia Hill shell is again so very distinct from that of the type species that I think it will be better to distinguish it as *A. granum*, var. *major*.

4. Alycæus magnus, n. sp.

Locality. Naga Hills, 150 miles eastward of Kohima (*Muspratt*, in coll. Col. Beddome).

Shell globosely turbinate, rather closely umbilicated, thick; sculpture fine regular costulation next the sutural tube, becoming finer and more irregular on the apical whorls; colour, specimen bleached; spire conoid, rounded, apex blunt; suture moderately impressed, the sutural tube long and well developed; whorls 5, the last much swollen, the constriction near the base of the sutural tube slightly swelling towards the aperture; aperture oblique, circular, with a slight angulation above; peristome double, continuous, strong, slightly expanded and reflected, the inner with a flange on the umbilical margin.

Size: maj. diam. 11·0, min. diam. 8·8; alt. axis. 5·25 mm.

Two specimens of this shell have been submitted to me by Col. Beddome, neither of them in the best state of preservation. It is a giant, yet modified, form of *A. nagaensis*, from Asalu, but it is more closely umbilicated and the costulation, for its greater size, is much finer; it is also more globose and more rounded at the apex.

5. Alycæus rubinus, n. sp.

Locality. Ruby Mines District, Upper Burmah (*W. Doherty*, in coll. Aldrich).

Shell globosely turbinate, closely umbilicated, of thin texture, the last whorl not much swollen; sculpture very fine close ribbing adjacent to the sutural tube, rest of shell smooth, with distant fine striæ; colour olivaceous ochre; spire conic, sides rounded; suture impressed; whorls 4, sides rounded, slightly constricted in front of the sutural tube, which is fine and moderately long; aperture oblique, circular; peristome thin, reflected, the double lips being scarcely perceptible, a slight nick on the inner upper margin.

Size: maj. diam. 6·0; alt. axis 5·0 mm.

6. Alycæus ochraceus, n. sp.

Locality. Ruby Mines District, Upper Burmah (*W. Doherty*, in coll. Aldrich).

Shell sub-depressedly turbinate; sculpture rather strong ribbing

on the swollen part of the last whorl, on the apical whorls it is close and fine; colour ochre; spire somewhat flattened, apex blunt; suture deep; whorls 4, the last moderately swollen; sharp constriction in front of sutural tube, followed by a strong ridge which is contiguous to the crenulate peristome; aperture circular, suboblique; peristome strongly crenulated, double; operculum horny, a large central excavated circular space, surrounded by a pale ring, well marked, rising above to the marginal portion.

Size: maj. diam. 4·5; alt. axis 1·5 mm.

The nearest known species allied to this is *A. crenatus*, of the Khasi Hills, but the ridge behind the aperture in this last lies further back with a short interval; the peristome is not so strongly crenulate. *A. plectocheilus* of Darjiling is a much smaller form.

7. ALYCÆUS DOHERTYI, n. sp.

Locality. Momeit, Burmah (*W. Doherty*, in coll. Aldrich).

Shell globosely turbinate, solid, not umbilicated; sculpture regular distant sharp costulation, closer and fine near the sutural tube; colour stone, with pink apex; spire rather high, conoid, rounded, apex blunt; suture impressed, the tube fine, rather long; whorls $4\frac{1}{2}$, the last swollen, constricted with a ronnded ridge midway between the sutural tube and the peristome; aperture expanded, ovate; peristome double, fine sharp crenulations on the outer margin, rounded on the inner.

Size: maj. diam. 3·25; alt. axis 2·8 mm.

This is quite a new form, partaking in the constriction and peristome of the characters of *A. plectocheilus*, *crenatus*, &c. Momeit lies N.N.E. of Mandalay, about midway between it and Bhamo and further east than Mogok in the Ruby Mine District.

8. ALYCÆUS BUSBYI, n. sp.

Locality. Nicobars (*G. Busby*, in coll. Dr. Hungerford).

Shell turbinate, of tumid form, widely umbilicated; sculpture smooth, fine ribbing near the sutural tube and still finer below; colour pale ochraceous; spire moderately high, apex blunt; suture deep, the sutural tube short and thick; whorls $4\frac{1}{2}$, very rounded, the last much swollen and compressed within the umbilical cavity, constriction simple, slight; aperture oblique circular; peristome double, the outer lip flat and expanding at right-angles to the whorl.

Size: maj. diam. 7·5; alt. axis 3·0 mm.

This is the largest species as yet known from the Nicobar Islands. I name it after its discoverer, who gave the specimen to Dr. Hungerford; its exact locality has not been recorded.

9. On a little-known European Viper, *Vipera ursinii*, Bonap. By G. A. Boulenger, F.Z.S.

[Received June 16, 1893.]

(Plate LI.)

About a year ago I received from my friend Dr. F. Werner, of Vienna, a remarkable Viper from Laxenburg, which differed very considerably from *Vipera berus* in its smaller eye, the small number of rows of scales and of ventral and caudal shields, the shape of the head, and the coloration. I requested my esteemed correspondent to procure further specimens from the same locality, and he was so kind as to send me five more, which showed clearly that the differences by which I was struck were not individual. Quite recently I received from Hr. Henkel, of Vienna, numerous specimens from Laxenburg, which removed all my doubts as to the specific distinction of this form from *V. berus*. Almost at the same time the number of the 'Zoologischer Anzeiger' for May 29th came into my hands, containing the description of it by Prof. von Méhely as a new variety of *V. berus*, from Rakos, on the left bank of the Danube, near Budapest, which he names var. *rakosiensis*. This name I therefore at once adopted, regarding the snake, however, as a distinct species, not as a variety[1]. In fact Prof. von Méhely seems to me to singularly underrate the taxonomic value of its characters in placing it as a variety between the typical form and the var. *prester*, which is merely a melanism of the former. It is true, however, that he appears to have overlooked two of the most important characters of the new form, viz. the small eye and the low number of ventral shields, although he draws attention to the number and shape of the dorsal scales.

I will now proceed to the description of this remarkable Viper, which should be called

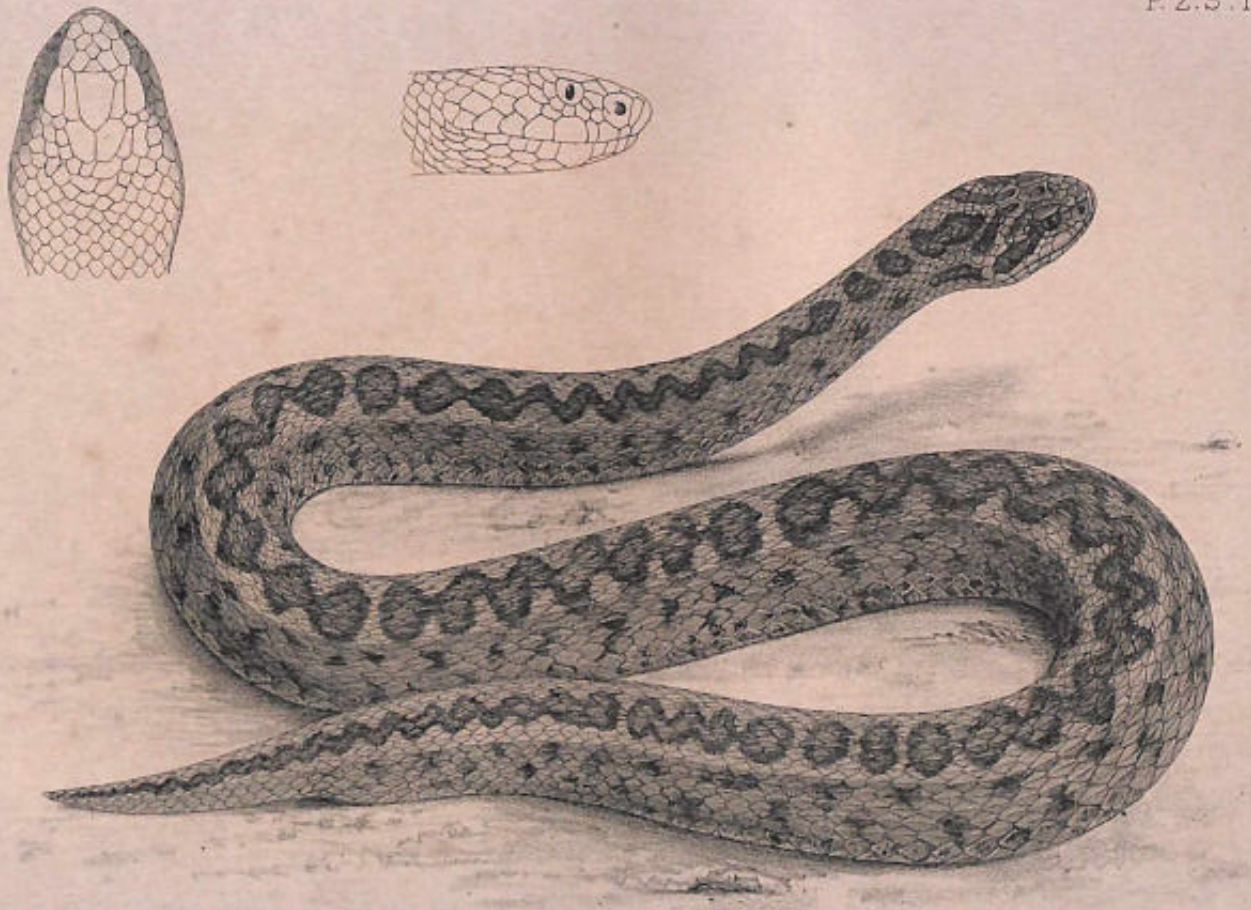
Vipera ursinii.

Pelias chersea vel *ursinii*, Bonap. Icon. Faun. Ital. (1835).

Pelias berus, part., Bonap. Amph. Eur., Mem. Acc. Tor. (2) ii. 1839, p. 440.

Pelias berus, var. *ursinii*, Cope, Proc. Ac. Philad. 1859, p. 342.

[1] On searching through the literature I soon after became convinced of the identity of this *V. rakosiensis* with the "Marasso alpino" of Bonaparte, a species described from young specimens obtained by Signor Orsini in the Abruzzi, near the province Ascoli. I am confirmed in this conclusion by my friend Count Peracca, who has very kindly examined at my request the two specimens from the Gran Sasso preserved in the Museum of the University of Turin, and mentioned by Camerano under *V. berus*. These, he informs me, have the eye very small, 19 rows of scales, 124 and 128 ventrals, 30 and 28 subcaudals. Bonaparte's specimens, one of which is preserved in the Museum of the Academy of Philadelphia, are stated to have 18 scales, 124–126 ventrals, and 28–30 subcaudals.—July 27, 1893.



R. Mintern del. et lith.

Mintern Bros. imp.

VIPERA URSINII.

Vipera berus, part., Camerano, Mon. Ofid. Vip. Ital., Mem. Acc. Tor. (2) xxxix. 1888, p. 35, pl. i. figs. 16–18.

Vipera berus, var. *rakosiensis*, Méhely, Zool. Anz. 1893, p. 190.

Eye very small, its horizontal diameter not exceeding its distance from the nostril, its vertical diameter not exceeding its distance from the oral margin.

The shape of the head, which is smaller in proportion than in *V. berus*, is remarkable for the somewhat pointed snout with its very obtuse, although sometimes slightly raised, canthus. The sincipital shields are constantly well developed, the frontal being longer than usual in *V. berus*, its length considerably exceeding its width, at least equalling its distance from the rostral, and usually exceeding the length of the parietals; the frontal is usually separated from the supraocular by a narrow shield or a series of small shields; rostral as broad as deep, or slightly deeper than broad, its tip in contact with a single small (apical) shield, very rarely with two; two canthal shields; upper præocular usually in contact with the nasal; a single series of scales between the eye and the upper labials; six to nine upper labials, usually seven or eight, third, fourth, third and fourth, or fourth and fifth below the eye; usually only one labial, third or fourth, below the eye; six to ten scales round the eye, usually eight or nine.

Scales in 19 rows, exceptionally 21 (21, exceptionally 19 or 23, in *V. berus*), the dorsals narrower and more strongly keeled than in *V. berus*; outer row perfectly smooth.

Ventrals 120 to 135 in males, 125 to 142 in females. On 70 specimens of *V. berus* I find 137 to 148 ventrals in males, 135 to 155 in females.

Subcaudals 30 to 37 in males, 23 to 28 in females. In *V. berus* I find 33 to 41 shields in males, 26 to 35 in females.

Length of tail 7 to 8 times in the total length in males, $9\frac{1}{2}$ to 11 times in females.

The following are the measurements, in millimetres, and records of the numbers of scales and shields in 40 specimens from Laxenburg:—

Sex.	Total Length.	Length of Tail.	Scales.	Ventrals.	Caudals.
♂	420	55	19	135	34
,,	400	50	19	130	33
,,	370	50	19	129	33
,,	370	48	21	129	32
,,	350	45	19	129	32
,,	350	45	19	120	33
,,	330	45	19	134	30
,,	320	40	19	131	30
,,	295	43	19	132	34
,,	255	37	19	132	36
,,	240	35	19	132	37
,,	220	30	19	126	36

TABLE (*continued*).

Sex.	Total Length.	Length of Tail.	Scales.	Ventrals.	Caudals.
♀	500	50	19	134	27
"	455	45	19	134	24
"	450	45	19	136	24
"	450	45	19	142	24
"	440	45	19	136	27
"	440	40	19	134	25
"	430	45	19	133	23
"	430	45	19	135	24
"	430	40	21	133	26
"	420	40	19	137	23
"	420	40	21	135	22
"	410	40	19	134	25
"	400	40	19	137	25
"	400	40	19	133	25
"	400	40	19	136	25
"	390	40	19	136	28
"	380	40	19	130	26
"	375	37	19	137	25
"	365	35	19	136	24
"	320	35	19	132	26
"	290	28	19	135	24
"	285	30	19	135	25
"	275	30	19	135	26
"	275	?	20	125	?
"	250	27	19	139	25
"	205	23	19	126	25
"	195	20	19	134	24
"	190	20	19	132	24

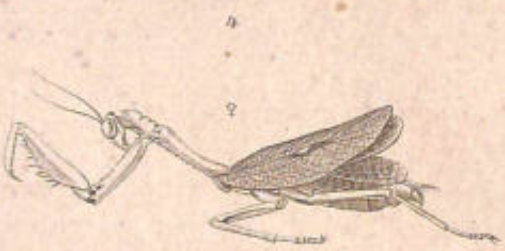
As regards the coloration, which has been very well described by Prof. v. Méhely, I must observe that Vipers generally vary so much, both individually and according to localities, that little reliance is to be placed, for specific distinction, on that character. *V. ursinii* resembles more in colour *V. renardi*, Christoph [1], from the Kirghiz Steppes and Turkestan, than the true *V. berus*; it further agrees with this Russian species in showing no marked sexual differences of colour. A series of large, dark brown, black-edged, transverse, oval or rhomboidal spots, which may or may not be confluent into a zigzag band, extends along the

[1] *Vipera renardi* (*Pelias renardi*, Christoph, Bull. Mosc. xxxiv. 1861, ii. p. 599) further agrees with *V. ursinii* and differs from *V. berus* in the pointed snout, the single apical shield in contact with the rostral, and the upper preocular usually in contact with the nasal. In *V. berus* there are normally two so-called apical shields; in the whole of my material I find only 7 specimens (or 10%) with a single one. The diameter of the eye exceeds its distance from the nostril; the canthus rostralis is angular and raised, rendering the upper surface of the snout concave; the sincipital shields usually well developed, the frontal narrow and longer than the parietals; 8 or 9 upper labials, fourth or fourth and fifth below the eye. The scales are in 21 rows, strongly keeled, the outer row smooth or faintly keeled. Ventrals: ♂, 130–144; ♀ 137–150. Subcaudals: ♂ 32–36; ♀ 27–34.

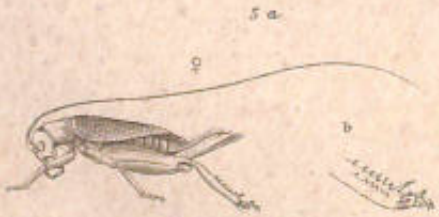












Reichenhacher del.

Th. Bannwarth lith. et imp. Vienna.

ORTHOPTERA OF GRENADA.

spine and is relieved by the pale olive-grey or yellowish colour of the dorsal area; the sides are darker, brown, with longitudinal series of small dark brown spots; head with the usual black markings; lips uniform yellowish; lower parts black, spotted with white, or grey, spotted or chequered with black and white; tail but rarely tipped with yellow; throat yellowish white in both sexes.

Herr L. von Kirchroth, of Mödling, who has collected large numbers of this Viper, kindly supplies me with the following information respecting its occurrence near Vienna:—

This Viper is distributed from Laxenburg westwards as far as the eastern slope of the Anninger Hills, southwards as far as Traiskirchen and Tribuswinkel. Its chief habitat is in the immediate vicinity of Laxenburg, where it is found in extraordinary numbers. The intendant of the Imperial Castle pays a premium for the destruction of Vipers, and in the course of last year more than 1000 specimens were brought to him. These snakes are found principally, though not exclusively, in the marshy meadows around the park; but few occur in the park itself. They feed chiefly on *Lacerta agilis* and also on mice. The largest male examined by Herr v. Kirchroth measured 410 millim., the largest female 450.

EXPLANATION OF PLATE LI.

Vipera ursinii, female, with enlarged upper and side views of head.

10. On the Orthoptera of the Island of Grenada, West Indies. By C. Brunner v. Wattenwyl.[1]

[Received May 27, 1893.]

(Plate LII.)

[The Society published last year (P. Z. S. 1892, p. 196) a memoir by Hofrath C. Brunner v. Wattenwyl and Professor J. Redtenbacher on the Orthoptera of the island of St. Vincent which those distinguished entomologists had been so good as to prepare at the request of the Joint Committee appointed by the Royal Society and the British Association to investigate the Fauna and Flora of the West Indian Islands.

I have now, on behalf of the same Committee, the pleasure of offering to the Society a paper by Herr Brunner v. Wattenwyl enumerating the Orthoptera of the neighbouring island of Grenada. Fifty-five species have been obtained there, nineteen of which were not met with in St. Vincent, eight of the number being described as new species. Of this order St. Vincent, on the other hand, possesses 62 species, 27 of which have not been found in Grenada.

It would at first sight appear from these facts that there is a

[1] [Communicated by D. Sharp, F.R.S., F.Z.S., on behalf of the Committee for investigating the Fauna and Flora of the West Indian Islands.]

very considerable difference between the Faunas of these two islands so far as Orthoptera are concerned, but I think the apparent great diversity may probably be found to be due to some extent to differences in the collecting that has been carried on in the two islands. The same collector, Mr. H. H. Smith, formed the collection from both islands, but it is understood that the one he procured while in St. Vincent is more complete than that which he formed in Grenada. If so, on the hypothesis that other of the St. Vincent species remain to be found in Grenada, the difference between the two islands may possibly be found to consist of the fact that Grenada has a richer Orthopterous fauna than St. Vincent possesses. Whether this really be the case, and if so, whether it be due to the much greater proximity of Grenada to the mainland cannot, however, be satisfactorily discussed until the data shall be much more complete than they are at present.

List of such of the Orthoptera of Grenada as have not been found in St. Vincent, with notes on their geographical distribution.

DERMAPTERA.

1. *Psalis americana*, Pal. St. Domingo.
2. *Spongophora*, sp. n.

BLATTODEA.

3. *Anaplecta lateralis*, Burm. S. America.
4. *Chorisoneura mysteca*, Sauss. Centr. and S. America.
5. *Phyllodromia notata*, sp. n.
6. *Pseudophyllodromia albinervis*, sp. n.
7. *Ischnoptera occidentalis*, Sauss. St. Domingo, Centr. and S. America.
8. *Pelmatosilpha marginalis*, sp. n.
9. *Periplaneta australasiæ*, Fabr. Wide distribution.
10. *Latindia castanea*, sp. n.
11. *Perasphæria rufipes*, sp. n.

ACRIDIODEA.

12. *Osmilia cœlestis*, Burm. Centr. and S. America.
13. *Anaulacomera antillarum*, sp. n.

GRYLLODEA.

14. *Nemobius cubensis*, Sauss. Cuba and Centr. America.
15. *Paragryllus rex*, Sauss. Brazil.
16. *Paracanthus* sp. (immature).
17. *Podoscirtus modestus*, sp. n.
18. *Metrypus claudicans*, sp. n.
19. —— *heros*, sp. n. (D. S.)]

List of Orthoptera of the Island of Grenada, W. I., by C. Brunner v. Wattenwyl, *March*, 1893.

Fam. Dermaptera.

(Determinata a Doct. A. de Bormans.)

Genus Psalis, Serv.

1. P. americana, Palisot de Beauvois.

Forf. americana, Pal. de Beauv. 1805, Ins. rec. en Afrique et Am. p. 165, Orth. tab. xix. fig. 1.

Patria: Balthazar, Grand Étang.—Occurrit in St. Domingo (*Pal. de Beauv., Serv., &c.*)

Genus Labia, Leach.

1. L. arcuata, Scudd.

Patria: Balthazar, Grand Étang, Chantilly.—Occurrit etiam in ns. St. Vincent et alibi.

2. L. brunnea, Scudd.

Patria: Chantilly, Mount Gay, St. John's River.—Occurrit etiam in ins. St. Vincent et alibi.

Genus Spongophora, Serv.

1. Sp. sp. nov.

Patria: Grand Étang.

Fam. Blattodea.

Tribus Ectobiidæ.

Genus Anaplecta, Burm.

1. A. lateralis, Burm.

A. lateralis, Burm.; Brunner, Nouv. Syst. des Blatt. p. 65.

Patria: Chantilly Estate.—Occurrit etiam in Colombia, Costa Rica, Buenos Aires (*coll. Br.*).

Genus Chorisoneura, Br.

1. C. mysteca, Sauss.

Ch. mysteca, Sauss; Brunner, Nouv. Syst. des Blatt. p. 258.

Patria: Mirabeau Estate (windward side).—Occurrit etiam in Mexico (*Sauss.*), Bogotá (*coll. Br.*).

Tribus Phyllodromiidæ.

Genus Phyllodromia, Serv.

1. P. adspersicollis, Stål.

Patria: Balthazar.—Occurrit etiam in insulis St. Vincent et Cuba (*Bol.*), in Brasilia et Mexico (*Stål, coll. Br.*).

2. P. DELICATULA, Guér.

Patria: Balthazar.—Occurrit etiam in insulis St. Vincent et Cuba (*Guérin*).

3. P. NOTATA, sp. n. (Plate LII. figs. 1 *a*, *b*.)

Caput atrum, fronte pallide testaceo, lineola fusca inter oculos signato, antennis fuscis. Pronotum marginibus lateralibus sat deflexis, margine postico leviter rotundato, disco fusco, antice et latere testaceo-circumdatum, ante marginem posticum vitta transversa testacea ornatum. Elytra fusco-ferruginea, margine antico toto testaceo-pellucido. Alæ infumatæ, vena spuria valde curvata, vena ulnari antica bi- vel uniramosa, campo apicali triangulari distincto. Pedes pallide testacei. Abdomen superne fuscum, pallide marginatum, subtus pallidum, utringue vitta longitudinali fusca, in ♂ in puncta soluta, ornatum. Segmentum abdominale dorsale septimum ♂ sine impressione. Lamina supraanalis ♂ transversa, medio leviter emarginata. Lamina subgenitalis ♂ ampla, haud compressa, stylo unico instructa. Cerci fusci. ♂ ♀.

	♂ ♀.
Long. corporis	9·5 millim.
„ pronoti	2·5
Lat. „	3·5
Long. elytrorum	10

Patria: St. George's (lee side), Balthazar (windward side).

Genus PSEUDOPHYLLODROMIA, Br.

1. P. ALBINERVIS, sp. n.

Caput latum, pronotum valde superans, castaneum, fascia pallida inter oculos signatum. Antennæ castaneæ. Pronotum valde transversum, marginibus lateralibus hyalino-testaceis, margine antico albido, disco elliptico castaneo, medio vittis duabus longitudinalibus albidis ornato, margine postico anguste albido. Elytra castanea, venis albidis, margine antico hyalino-testaceo. Alæ flavo-hyalinæ, venis ferrugineis, vitta fusca pone marginem anticum extensa, vena ulnari antica uniramosa, campo apicali triangulari plicato. Pedes pallide testacei, unicolores. Abdomen ferrugineum. Cerci ferruginei. Lamina supraanalis ♀ transversa. Lamina subgenitalis triangulariter emarginata. ♀.

	♀.
Long. corporis	7 millim.
„ pronoti	1·8
Lat. „	2·8
Long. elytrorum	7·5

Patria: Mount Gay Estate (leeward side).

Species multiplices hujus generis ex America meridionali provenientes facile distinguuntur coloratione et pictura pronoti elytrorumque.

Genus Ischnoptera, Burm.

1. I. occidentalis, Sauss.

I. occidentalis, Brunner, Nouv. Syst. des Blatt. p. 141.

Patria: Mount Gay Estate, Balthazar (windward side).—Occurrit etiam in Mexico, St. Domingo, Peru (*coll. Br.*).

Hoc genus, abundans speciebus imperfecte descriptis, revidendum est.

Tribus Epilampridæ.

Genus Epilampra, Burm.

1. E. brevis, Br.

E. brevis, Brunner, Orth. of the Island of St. Vincent (Proc. Zool. Soc. Lond., March 1892, p. 203, tab. xv. fig. 3).

Patria: Balthazar (windward side).—Occurrit etiam in ins. St. Vincent.

Nonnullæ larvæ ex eodem loco provenientes, huic speciei attribuendæ, differunt corpore castaneo, pronoto et metanoto castaneis, marginibus lateralibus testaceis.

Tribus Periplanetidæ.

Genus Pelmatosilpha, Dohrn.

1. P. marginalis, sp. n. (Plate LII. fig. 2.)

Caput magnum, a pronoto totum absconditum, atrum, nitidum, fascia ferruginea arcuata inter oculos ornatum. Pronotum parabolicum, postice truncatum, atrum, nitidum, utrinque fascia longitudinali, intramarginali ferruginea signatum. Elytra abbreviata, rotundata, in ♂ segmentum sextum abdominale vix superantia, fusco-castanea, cornea, venis vix distinctis. Alæ elytris parum breviores, castaneæ. Femora ferruginea, margine antico necnon apice fusco-picta. Tibiæ et tarsi atri. Lamina supraanalis ♂ transversa, trapezoidea, margine postico levissime emarginata. Lamina subgenitalis ♂ transversa, rotundata et leviter emarginata, utrinque stylis instructa. Cerci longi, atri. ♂.

	♂.
Long. corporis....	18–22 millim.
„ pronoti	6–7
Lat. „	7·8–8·5
Long. elytrorum ..	9·5–10·5
Long. fem. post. ..	5–6·5

Patria: Balthazar (windward side).

Genera *Eurycotis*, Stål, et *Pelmatosilpha*, Dohrn, in "Révision du Syst. des Orth." (Ann. del Museo civico hist. nat. di Genova, s. 2, vol. xiii. 1893, p. 34), in ordinem redacta, comprehendunt species Americanas, olim generibus *Polyzosteriæ* et *Periplanetæ* adjunctas. *Stylopyga antillarum*, Br. (Orth. of the Island of St. Vincent, p. 204), in genus *Eurycotim* locanda.

Genus Periplaneta, Burm.

1. P. australasiæ, Fabr.

P. australasiæ, Brunner, Nouv. Syst. des Blatt. p. 233.
Patria: Balthazar.

Tribus Panchloridæ.

Genus Panchlora, Burm.

1. P. viridis, Burm.?

P. viridis, Brunner, Nouv. Syst. des Blatt. p. 273.
Patria: Mount Gay Estate (leeward side).—Occurrit etiam in ins. St. Vincent, Cuba, et alibi.

Genus Leucophæa, Br.

1. L. surinamensis, L.

L. surinamensis, Brunner, Nouv. Syst. des Blatt. p. 278.
Patria: Grenada.—Occurrit etiam in ins. St. Vincent et alibi.

Genus Nauphoeta, Burm.

1. N. lævigata, Pal.

N. lævigata, Brunner, Nouv. Syst. des Blatt. p. 278.
Patria: Grenada.

Tribus Corydiidæ.

Genus Latindia, Stål.

1. L. castanea, sp. n.

Unicolor, opaca, castanea, tota holosericea. Pronotum angulis posticis rotundatis. Elytra angusta, abdomen superantia, venis parum distinctis. Pedes graciles, testacei. ♀.

	♀
Long. corporis	4·5 millim.
„ pronoti	1·5
Lat. „	1·3
Long. elytrorum	5

Patria: Balthazar.

Tribus Perisphæriidæ.

Genus Perasphæria, Br.

1. P. rufipes, sp. n. (Plate LII. fig. 3.)

Elongata, valde convexa, atra, nitida, impresso-punctata. Caput atrum, fronte lata, valde depressa; antennis, labro et palpis rufo-ferrugineis. Pronotum parabolicum, disco inæquali, marginibus antico et lateralibus anguste limbatis, margine postico truncato. Elytra lobiformia, lateralia mesonotum haud superantia, profunde punctata, latere externo limbato. Pedes breves, rufo-ferruginei. Cerci minimi, rufi, apice nigri. ♀.

	♀.
Long. corporis.....	28 millim.
„ pronoti	8·5
Lat. „	9·5
Long. elytra.....	4
„ fem. post.	4

Patria: Balthazar.

Fam. MANTODEA.

Tribus MANTIDÆ.

Genus MUSONIA, Stål.

1. M. SURINAMA, Sauss.

Patria: Balthazar, St. George's Riv., Mount Gay Estate.—Occurrit etiam in ins. St. Vincent et alibi.

Tribus VATIDÆ.

Genus PARASTAGMATOPTERA, Sauss.

1. P. LOBIPES, Redt. (Plate LII. fig. 4.)

P. lobipes, Redt. P. Z. S. 1892, p. 206, tab. xv. fig. 8.

Femina, in loco citato haud descripta, differt a mare pronoto denticulis marginalibus fortioribus, necnon disco tuberculis minimis ornato, elytris opacis viridibus, campo deflexo valde dilatato, pone medium latissimo, campo dorsali stigmate albido, macula minima fusca apposita instructo, alis flavo-tessellatis, femoribus intermediis et posticis apice magis infuscatis et lobo majore instructis, tarsis fuscis.

	♀.
Long. corporis.....	45 millim.
„ pronoti	16·5
„ elytrorum	25
„ femor. ant.	13
„ „ post....	12·5

Patria: Mount Gay Estate, Granville (windward side).—Occurrit etiam in ins. St. Vincent.

Mares et feminæ occurrunt interdum femoribus totis viridibus.

Fam. PHASMODEA.

Tribus BACUNCULIDÆ.

Genus CLONISTRIA, Stål.

1. C. LINEARIS, Drury (?).

Patria: Balthazar.—Occurrit etiam in ins. St. Vincent.

Tribus Bacteriidæ.

Genus Bacteria, Latr.

1. B. cyphus, Westw.

Patria: Caliveny Estate (windward side).—Occurrit etiam in ins. St. Vincent.

Genus Diapherodes, Gay.

1. D. gigas, Drury.

Patria: Grenada.—Occurrit etiam in ins. St. Vincent et alibi.

Fam. Acridiodea.

Tribus Tettigidæ.

Genus Tettix, Charp.

1. T. quadriundulatus, Redt.

T. quadriundulatus, Redt. P. Z. S. 1892, p. 208, tab. xvi. fig. 10.

Patria: Mount Gay Estate, Caliveny Estate, Balthazar.—Occurrit etiam in insula St. Vincent.

Tribus Tryxalidæ.

Genus Orphula, Stål.

1. O. punctata, De Geer.

Patria: Balthazar, Mount Gay Estate.—Occurrit etiam in ins. St. Vincent et alibi.

Tribus Acridiidæ.

Genus Vilerna, Stål.

1. V. æneo-oculata, De Geer.

Patria: Lake Antoine Estate, Balthazar.—Occurrit etiam in ins. St. Vincent et alibi.

Genus Caletes, Redt.

1. C. apterus, Redt.

C. apterus, Redt. P. Z. S. 1892, p. 210, tab. xvi. fig. 11.

Patria: Balthazar.—Occurrit etiam in ins. St. Vincent.

Genus Schistocerca, Stål.

1. S. columbina, Thunb.

Patria: Mount Gay Estate, Caliveny Estate.—Occurrit etiam in insula St. Vincent et alibi.

Genus Osmilia, Stål.

1. O. cœlestis, Burm.

Acridium cœlestre, Burmeister, 1839, Handb. ii. p. 634.

Patria: Balthazar, Chantilly Estate, Mount Gay Estate.—Occurrit etiam in Honduras, Peru, Brasilia (*coll. Br.*).

Fam. Locustodea.

Tribus Phaneropteridæ.

Genus Anaulacomera, Stål.

1. A. antillarum, sp. n.

Vicina A. harpaginis, *Br.*

Frons rotundata. Fastigium verticis superne tuberculatum, sulcatum. Fastigium frontis obtusum. Pronotum lobis deflexis æque altis ac longis, margine inferiore rotundato. Elytra pallide viridia, ramo radiali medio oriente, ante medium furcato. Femora antica et intermedia subtus submutica. Femora postica subtus, margine externo a medio, margine interno apice spinulosa. Segmentum abdominale ultimum ♂ amplum, truncatum. Cerci ♂ longi, flexuosi, apice compressi, acuminati, in quarta parte basali ramo interno valde deplanato, apice attenuato et incurvo instructi, necnon medio denticulati et in quarta parte apicali altero ramulo depresso, acuminato, apice incurvo ornati. Lamina subgenitalis ♂ apice angustata, emarginata. Ovipositor longiusculus, medio parum dilatatus. ♂ ♀.

	♂.	♀.
Long. corporis.....	15	18 millim.
„ pronoti.....	4	4
„ elytrorum ..	29	31
Lat. „ medio	5·5	6
Long. femorum post.	16	16·5
„ ovipositoris ..		9·3

Patria: Balthazar, St. George's (leeward side), Mount Gay, Grand Ance.

Genus Stilpnochlora, Stål.

1. S. marginella, Serv.

Patria: Balthazar.—Occurrit etiam in ins. St. Vincent necnon in tota America meridionali.

Genus Microcentrum, Scudd.

1. M. pallidum, Br.

Patria: Balthazar, Mount Gay.—Occurrit etiam in ins. St. Vincent, Cuba, Martinique, necnon in Colombia.

Tribus Pseudophyllidæ.

Genus Bliastes, Stål.

1. B. superbus, Redt.

Bl. superbus, Redt. P. Z. S. 1892, p. 211, tab. xvi. fig. 12.

Patria: Balthazar, Mount Gay.—Occurrit etiam in ins. St. Vincent.

2. B. STRIOLATA, Redt.

B. striolata, Redt. P. Z. S. 1892, p. 212, tab. xvi. fig. 13.

Patria: Balthazar.—Occurrit etiam in ins. St. Vincent.

Tribus CONOCEPHALIDÆ.

Genus CONOCEPHALUS, Thunb.

1. C. GUTTATUS, Serv.

Patria: Chantilly Estate.—Occurrit etiam in ins. St. Vincent, necnon in Mexico, et alibi.

2. C. MUTICUS, Redt.

C. muticus, Redt. 1891, Monogr. d. Conocephal. (Verh. d. k. k. zool.-bot. Ges. in Wien, p. 393).

Patria: Mount Gay Estate.—Occurrit etiam in ins. St. Vincent et Cuba (*Redt.*).

3. C. MAXILLOSUS, Serv.

Patria: Mount Gay.—Occurrit etiam in ins. St. Vincent, Cuba, St. Domingo, necnon in Guyana, Brasilia, et alibi (*Redt.*).

4. C. INFUSCATUS, Scudd.

Patria: Mount Gay.—Occurrit etiam in ins. St. Vincent, Cuba, et in Panama, et alibi (*Redt.*).

5. C. PUNCTIPES, Redt.

Patria: Balthazar.—Occurrit etiam in ins. St. Vincent.

6. C. SURINAMENSIS, Redt.

Patria: Caliveny Estate.—Occurrit etiam in ins. St. Vincent et in Guyana.

Genus XIPHIDIUM, Serv.

1. X. SALTATOR, Sauss.

Patria: St. George's, Mount Gay.—Occurrit etiam in ins. St. Vincent et Cuba, necnon in Panama, Colombia, Venezuela, Guyana, Brasilia, Uruguay (*Redt.*).

X. fasciatum De Geer (Redt. l. c. p. 506), certe cum hac specie congruit.

2. X. PROPINQUUM, Redt.

Patria: Mount Gay.—Occurrit etiam in ins. St. Vincent, necnon in Guatemala, Venezuela, et alibi (*Redt.*).

Tribus STENOPELMATIDÆ.

Genus PHERTERUS, Br.

1. P. CUBENSIS, De Haan.

Patria: Balthazar.—Occurrit etiam in ins. St. Vincent, Cuba, Haiti et in Brasilia (*Brunner*).

Fam. Gryllodea.

Tribus Gryllotalpidæ.

Genus Gryllotalpa, Latr.

1. G. hexadactyla, Perty.

Patria: Balthazar.—Occurrit etiam in ins. St. Vincent et alibi.

Genus Tridactylus, Oliv.

1. T. minutus, Scudd.

Patria: St. John's River (leeward side), St. George's, Mount Gay Estate.—Occurrit etiam in ins. St. Vincent, necnon in Texas, Illinois (*coll. Br.*).

Tribus Gryllidæ.

Genus Nemobius, Serv.

1. N. cubensis, Sauss.

N. cubensis, Sauss. 1870, Mission sc. au Mexique, p. 384, tab. vii. fig. 5.

Patria: Balthazar.—Occurrit etiam in Cuba, Mexico (*Sauss.*), Costa Rica, New-Orleans (*coll. Br.*).

Genus Gryllus, L.

1. G. assimilis, Fabr.

Patria: Balthazar.—Occurrit etiam in ins. St. Vincent et alibi.

Tribus Myrmecophilidæ.

Genus Ectadoderus, Guér.

1. E. antillarum, Redt.

E. antillarum, Redt. Orth. of St. Vincent, p. 218, tab. xvii. fig. 16.

Patria: St. George's, Mount Gay.—Occurrit etiam in ins. St. Vincent.

Tribus Œcanthidæ.

Genus Paragryllus, Sauss.

1. P. rex, Sauss.

P. rex, Sauss. 1877, Mél. Orth. fasc. vi. p. 553, tab. 16. fig. xli. 1.

Patria: Black Forest Estate. — Occurrit etiam in Brasilia (*Sauss.*).

Tribus Trigonidiidæ.

Genus Cyrtoxiphus, Br.

1. C. vittatus, Bolivar.

C. vittatus, Bolivar, 1888, Orth. de l'Ile de Cuba (Mém. Soc. ent. de France, i. p. 44).

Patria: Balthazar, St. George's, Mount Gay.—Occurrit etiam in ns. St. Vincent et Cuba.

Tribus Eneopteridæ.

Genus Paroecanthus, Sauss.

1. P. sp. inc. Larva.

Patria: Balthazar.

Genus Orocharis, Uhl.

1. O. gryllodes, Pallas.

Patria: Balthazar.—Occurrit etiam in ins. St. Vincent, in Texas, Mexico, St. Domingo, et alibi.

Genus Podoscirtus, Serv.

1. P. modestus, sp. n.

Parvus, valde affinis P. cicuri, *Sauss.*, *et* rufidulo, *Sauss.*, *ex insulis Philippinis et Nova-Caledonia provenientibus. Fulvo-testaceus. Antennæ fulvæ. Elytra unicoloria, in longitudinem venosa, quadrato-reticulata, vena mediastina 4-ramosa. Alæ breviter caudatæ. Pedes unicolores. Metatarsus posticus margine externo 4-spinulato, margine interno 2-spinulato. Ovipositor valvis apicalibus nigris, obtusis.* ♀.

	♀.
Long. corporis	8 millim.
„ pronoti	2
„ elytrorum	10
„ femorum post..	6·5
„ ovipositoris ..	5·5

Patria: St. George's.

Genus Metrypus, Br.

1. M. claudicans, sp. n. (Plate LII. figs. 5 *a*, *b*.)

Fulvo-testaceus, holosericeus. Ocellus anticus vix perspicuus. Palporum articulus ultimus ovatus, infundibuliformis. Elytra venis fuscis, campo laterali haud reticulato, vena mediastina 7-ramosa, campo dorsali in longitudinem venosa, inter venas irregulariter reticulato. Femora antica dilatata, margine superiore arcuato. Femora postica apice parum attenuata. Tibiæ posticæ crassæ, superne deplanatæ, dense spinulosæ,

spinis majoribus raris. Tarsi postici brevissimi, subobliterati, metatarso tantum apice utrinque unispinato. Ovipositor apice acuminato, valvula superiore margine externo subtilissime serrulato, valvula inferiore apice truncato, margine externo 5–6 dentato, margine interno lævi. ♀.

	♀.
Long. corporis	20 millim.
„ pronoti	4
„ elytrorum	15
„ femor. post.	12·5
„ tib. post.	12·5
„ ovipos.	11

Patria: St. George's.

Hæc species distinguitur campo dorsali elytrorum irregulariter reticulato, et præcipue tibiis posticis et tarsis deformibus.

2. M. HEROS, sp. n. (Plate LII. fig. 6.)

Magnus, fulvus, holosericeus. Ocellus anticus distinctissimus. Palporum articulus ultimus ovatus, infundibuliformis. Elytra venis parum fuscioribus, campo laterali quadrato-reticulato, vena mediastina 9-ramosa, campo dorsali in longitudinem venoso, inter venas irregulariter reticulato. Femora antica parum dilatata. Femora postica crassa. Tibiæ posticæ utrinque confertim spinatæ, spinis majoribus 4–5 interpositis. Metatarsus posticus superne margine externo 4-spinato, margine interno unispinato. Ovipositor apice breviter truncato, valvula superiore margine externo subtilissime serrulato, valvula inferiore margine externo dentato. ♀.

	♀.
Long. corporis	35 millim.
„ pronoti.....	6·5
„ elytrorum.....	30
„ femor. post.	21
„ tibiarum post. ..	16·5
„ ovipos.	16

Species magnitudine insignis.

Patria: Balthazar.

EXPLANATION OF PLATE LII.

Fig. 1 *a*. *Phyllodromia notata* (p. 602), ♂.
1 *b*. Ejusdem ala dextra.
2. *Pelmatosilpha marginalis* (p. 603), ♂.
3. *Perisphæria rufipes* (p. 604), ♀.
4. *Parastagmatoptera lobipes* (p. 605), ♀.
5 *a*. *Metrypus claudicans* (p. 610), ♀.
5 *b*. Ejusdem tibia postica sinistra.
6. *Metrypus heros* (p. 611), ♀.

November 7, 1893.

Sir W. H. Flower, K.C.B., LL.D., F.R.S., President, in the Chair.

The Secretary read the following reports on the additions made to the Society's Menagerie during the months of June, July, August, and September, 1893 :—

The registered additions to the Society's Menagerie during the month of June were 146, of which 71 were by presentation, 24 by purchase, 24 by birth, and 27 were received on deposit. The total number of departures during the same period by death and removals was 106.

The most noticeable additions during the month were :—

1. Four South Island Robins (*Miro albifrons*) from New Zealand, presented by Captain Edgar J. Evans, June 6th, being the first examples of these interesting Antipodean representatives of the European Robin that have reached us.

2. An adult male of Stairs's Monkey, *Cercopithecus stairsi*, presented by Mr. F. Hintz on June 7th.

It is of great interest to receive a second specimen of this well-marked Monkey, which I have lately described from a specimen living in the Society's Gardens (see P. Z. S. 1892, p. 580, pl. xl.).

In reply to inquiries, Mr. Hintz informs me that the Monkey was brought by his brother from Mozambique about eight years ago. When first obtained it was quite young and only about 20 inches in length; it is now obviously quite adult and agrees generally with the figure above referred to. It measures in length of body about 18 inches, tail only 7 inches, the apical portion of the tail being absent: in colour it nearly resembles the first specimen, having the same characteristic rufous bands on each side of the head; but it also shows a patch of rufous on the rump, just above the tail, which was not noticeable in that specimen.

The arms outside are black-grey, the hands quite black; the legs outside are grey; the feet are not quite so black as the hands; the back of the shoulders is dark grey, the back itself, especially the lower part, of a yellowish grey; the anal region and about 3 inches at the base of the tail are rufous; the scrotum is very dark blue (indigo): the inner side of the limbs and the belly are milky white; the face is black. There are two patches of chestnut-coloured hair on the forehead, next the ears, as in the former example. The whole of the hair of the upper parts is minutely grizzled.

Compared with the young female figured P. Z. S. 1892, pl. xl., the present animal is more darkly coloured. It has not the yellowish back such as the young female had.

3. A family of six European Beavers, consisting of a male, a female, and four young ones, from the Lower Rhone, purchased (of Mr. Vergnier Cantarel, of Toulouse, and received) June 29.

I am not aware that specimens of the European Beaver (*Castor*

fiber) have been previously exhibited in the Society's Gardens. In general appearance these animals are certainly easily distinguishable from the American form, of which we have several specimens, being much browner in colour.

The registered additions to the Society's Menagerie during the month of July were 165 in number; of these 58 were acquired by presentation, 44 by purchase, 44 by birth, and 19 were received on deposit. The total number of departures during the same period by death and removals was 115.

The registered additions to the Society's Menagerie during the month of August were 208; of these 130 were acquired by presentation, 13 by purchase, 14 by birth, 1 by exchange, and 51 were received on deposit. The total number of departures during the same period by death and removals was 137.

The registered additions to the Society's Menagerie during the month of September were 96; of these 54 were acquired by presentation, 21 by purchase, 8 were bred in the Gardens, and 13 were received on deposit. The total number of departures during the same period by death and removals was 108.

Amongst the additions I may invite special attention to the following:—

1. A young Corean Sea-Eagle (*Haliaëtus branickii*), obtained direct from Corea by the authorities of the Zoological Gardens of Hamburg, and purchased from them Sept. 21st. The example is very small in size, but is apparently a young male of this species. (*Cf.* Bolau, P. Z. S. 1892, p. 173.)

2. A fine specimen of the Great Grebe of Antarctic America (*Æchmophorus major*) in full plumage, new to the Collection, obtained by purchase. I exhibit a coloured drawing of this bird, which is the first specimen of the species that I have seen alive.

I also take this opportunity of exhibiting a living example of the Goliath Beetle (*Goliathus druryi*), which was presented to the Society by Mr. Frederic W. Marshall, of Reed Vale, Teignmouth. Mr. Marshall informs me that he received this insect alive, but weak, on the 16th May last. It was brought to him from Eastern Akim, some 4 or 5 days' journey from Accra.

It seems to do well in our Insect House, and feeds readily on melon. It has also eaten grapes and very ripe pears, but prefers melon to any other food. It drinks tea and cocoa.

The Beetle is of course well known, but, so far as I am aware, no living specimen has previously been brought to England. The present example has been figured in the 'Field,' Oct. 21, 1893, p. 607.

Mr. Sclater offered a few remarks on the Zoological Gardens of Stuttgart, Frankfort, and Cologne, which he had visited during the past summer.

In Herr Nill's little garden at Stuttgart were observed good examples of *Struthio molybdophanes* from Somaliland, and a fine and very tame pair of the Great Anteater (*Myrmecophaga jubata*).

In the Zoological Garden of Frankfort, where Dr. Seitz had

lately become Director, there were a pair of the Black-tailed Gnu (*Connochætes gorgon*), a male and two females of *Cobus sing-sing*, and examples of *Galidia elegans* and *Bucorax abyssinicus*. The series of German native birds was large and contained a specimen of *Melanocorypha yeltoniensis*, and of several other species rarely seen in captivity.

In the Zoological Garden of Cologne there were many fine Antelopes—*Hippotragus equinus*, *Cobus sing-sing*, *Oryx leucoryx* (♂, ♀, et ♀ jr.), and *Bubalis mauritanica* (♂, ♀, ♀, ♀ jr.),—besides examples of such scarce mammals as *Bassaris astuta* (♂ et ♀), *Ursus ornatus*, and *Microcebus myoxinus*. Amongst the birds Mr. Sclater had noticed specimens of *Geophaps plumifera*, *Crax albini*, *Plectropterus niger*, *Anas andamanensis*, *Haliaëtus branickii*, and *Chunga burmeisteri*.

The following extract was read from a letter addressed to Mr. Sclater by Mr. J. G. Millais, F.Z.S., dated "Kroonstad, Orange Free State, September 19, 1893":—

"I have been all this year far in the heart of Eastern Mashonaland, searching for that much-desired creature the White Rhinoceros (*Rhinoceros simus*), and, though I did not get one, I found what was most undoubtedly its spoor and droppings. I do not at present wish to particularize the place too exactly, but it lies in the most horrible thirst-land on the earth, and it was only with considerable difficulty that I managed to get back to one of the big rivers, having nearly died of thirst. I took a small wagon, which I and our old Dutch hunter had constructed out of wheels and logs, and this we found the donkeys could hardly pull through the dense bush, which must be passed through to get to this unholy country. On arriving at the pan where a black hunter had told me the animals drank, we found that it was dry, and though the spot was still damp we could do nothing but make all possible haste back to the mountains, to obtain water for ourselves and our emaciated beasts. To make matters worse, my companion was seized with dysentery. Moreover, a lion came in the night into a native village and killed three of my best donkeys. Thus we got stuck a week without being able to move, having a real bad time with the natives, who saw our condition and would have stolen everything of value if they could.

"I am quite sure the Rhinoceroses could be obtained, from what I learnt from the natives, but the country would have to be approached from an entirely different direction and with pack-donkeys.

"The natives know and describe the two species of Rhinoceros quite correctly. One, the white, which they call *m'combo*, they say feeds only on grass, has a square mouth, and the females drive their calves in front. The black is much more savage, feeds on bushes, has a long lip, and the calves follow the mother. This shows that they know the animal well, although they admit that it is scarce."

The Secretary read the following extract of a letter addressed to him by Babu Ram Bramha Sányál, C.M.Z.S., dated Zoological Garden, Calcutta, July 27, 1893 :—

"I am not aware whether closely allied species of *Semnopithecus* have ever interbred anywhere. They are rather exclusive in their ideas in respect to matrimonial relationship. Anyhow, such an event has just happened in this Garden. The Phayre's Leaf Monkey (*Semnopithecus phayrei*, Blyth) has given birth to a young one—a lovely little babe, of a delicate light orange colour. As there has been no other male in the same cage except the *S. cristatus*, there is no doubt of the young one being a hybrid between these two species. These Monkeys have been living together since 1880, and although they agreed very well, they were never observed to be over friendly. Even now the male does not appear to take any interest in the offspring."

A drawing of the mother, and young one at two weeks old, was exhibited.

In the course of some remarks on the preceding communication,



Cercopithecus lalandii (mother and young).

Mr. Sclater stated that during the past ten years five Monkeys of the

genera *Macacus* and *Cercopithecus* had been born in the Society's gardens, namely:—

Macacus sinicus, April 2, 1885.
Macacus rhesus, April 6, 1887.
Cercopithecus callitrichus, Feb. 22, 1890.
Macacus rhesus, March 31, 1890.
Cercopithecus lalandii, June 11, 1893.

Concerning the last birth a curious fact had been observed and reported by the keepers—that the young monkey, which lived about two months, had been in the habit of sucking both of the mother's teats at once, as shown in the sketch taken by Mr. Holding (see p. 615), who had himself witnessed the act.

Mr. Tegetmeier exhibited a mounted specimen of a Grouse from Scotland, supposed to be a hybrid between *Tetrao tetrix* and *Lagopus scoticus*.

Mr. G. A. Boulenger, F.Z.S., read a paper "On a Nothosaurian Reptile from the Trias of Lombardy, apparently referable to *Lariosaurus*." His description was based on a small, nearly perfect specimen from Perledo, showing the ventral aspect, belonging to the Senckenberg Museum in Frankfort-on-Main, which had been intrusted to him by the Directors of that institution and was exhibited before the Meeting. The author pointed out the presence of a series of minute teeth on the pterygoid bones, and of an entepicondylar (ulnar) foramen in the humerus. The number of phalanges was 2, 3, 4, 4, 3 in the manus, and 2, 3, 4, 5, 4 in the pes; the terminal phalanx was flattened and obtusely pointed, not claw-shaped. In discussing the affinities of this reptile the author stated that the *Lariosaurus* described by Diecke did not appear to be generically distinguishable from the *Neusticosaurus* of Seeley, which he referred to the *Lariosauridæ*, regarding that family as intermediate between the *Mesosauridæ* and the *Nothosauridæ*, though nearer the latter. The *Mesosauridæ*, in his opinion, formed one suborder, the *Lariosauridæ* and *Nothosauridæ* together a second suborder, of the order *Plesiosauria*.

This paper will be printed entire in the Society's 'Transactions.'

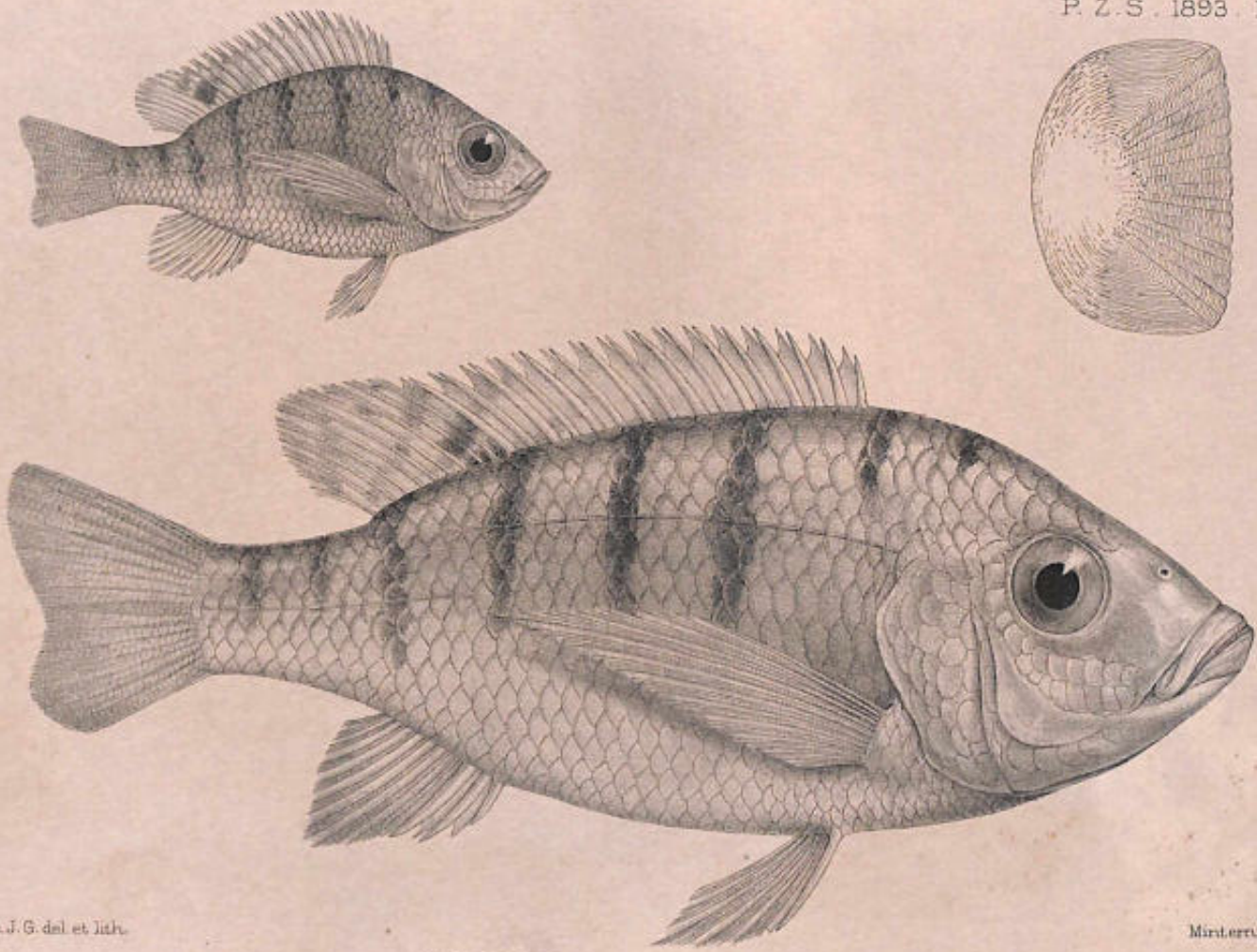
The following papers were read:—

1. Second Report on the Reptiles, Batrachians, and Fishes transmitted by Mr. H. H. Johnston, C.B., from British Central Africa. By Dr. A. Günther, F.R.S., V.P.Z.S.

[Received November 7, 1893.]

(Plates LIII.–LVII.)

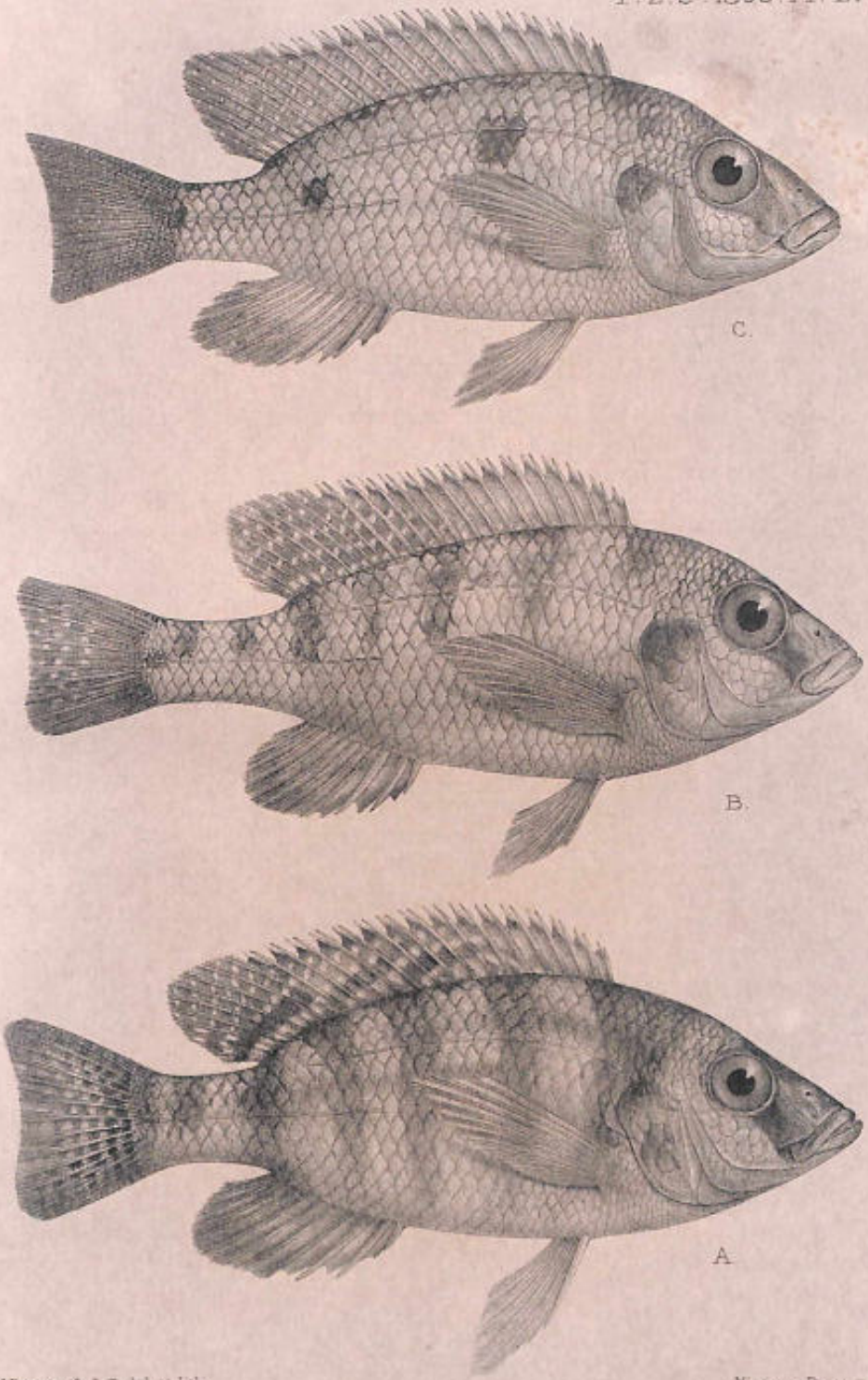
Since the publication of my first Report on this subject (see P. Z. S. 1892, p. 555) two more consignments have been received



R. Mintern & J. G. del. et lith.

Mintern Bros. imp.

CHROMIS SQUAMIPINNIS.

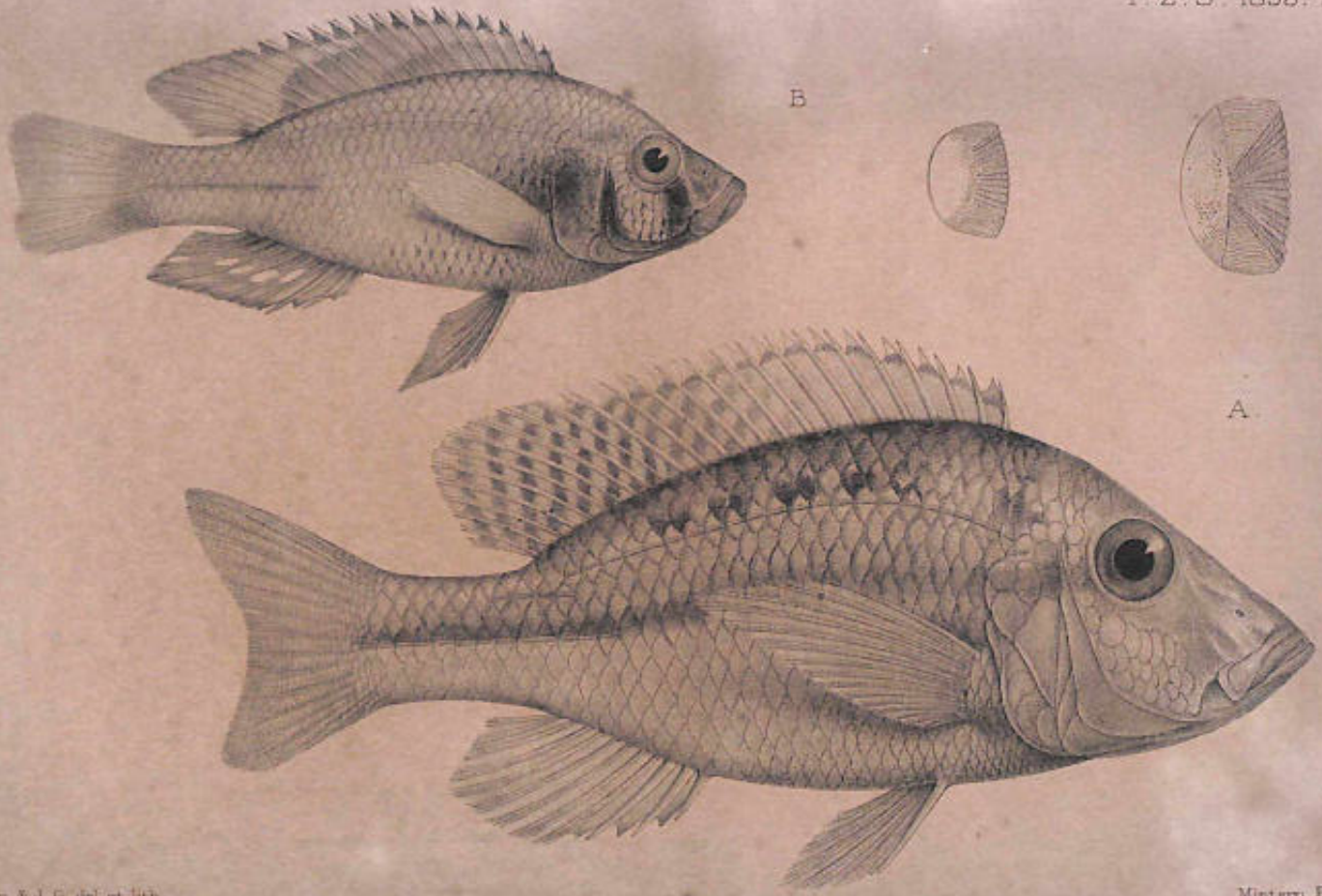


R. Mintern & J. G. del. et lith.

Mintern. Bros. imp.

CHROMIS

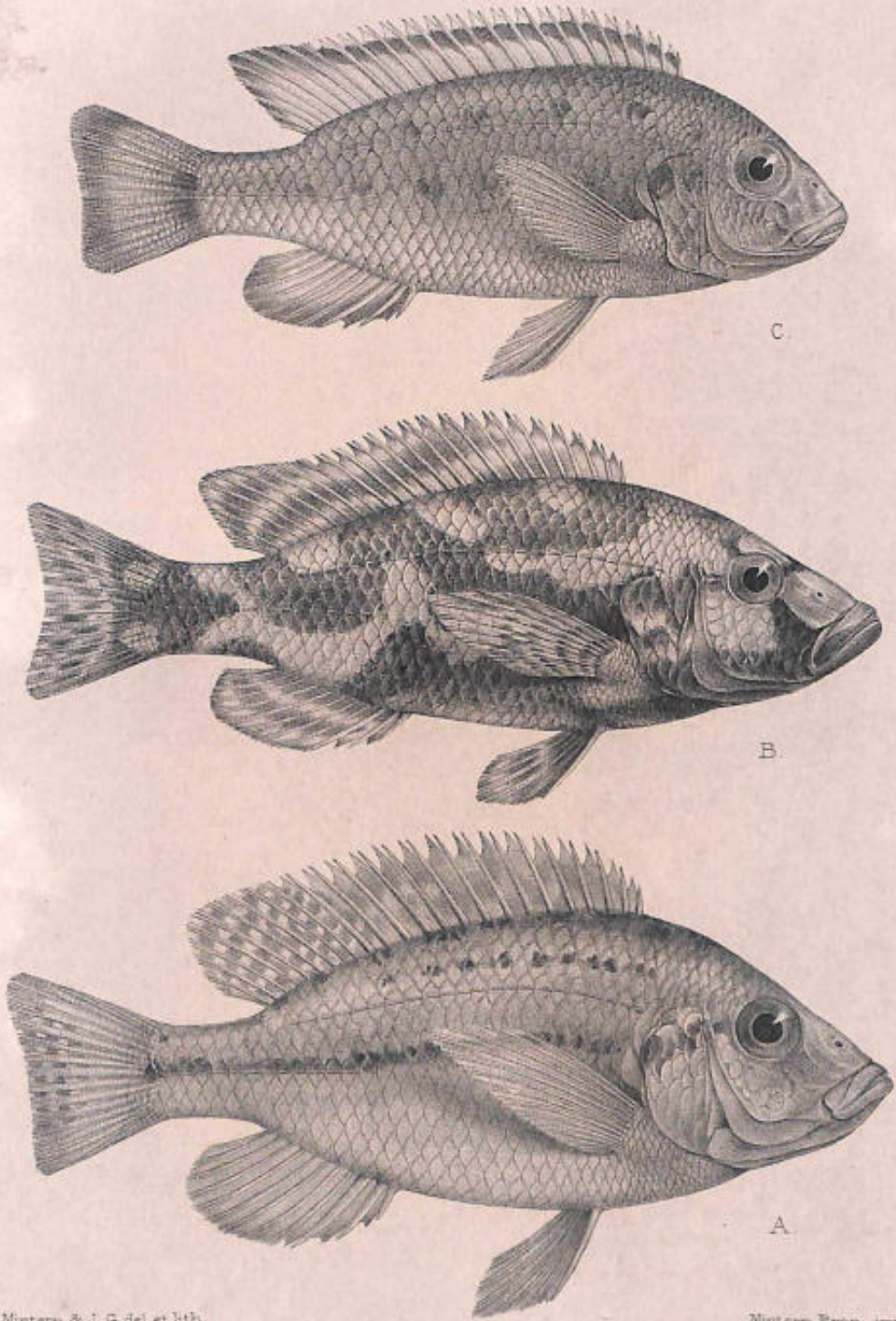
A. CH. JOHNSTONI B. CH. SUBOCULARIS C. CH. TETRASTIGMA.



R. Mintern & J. G. del. et lith.

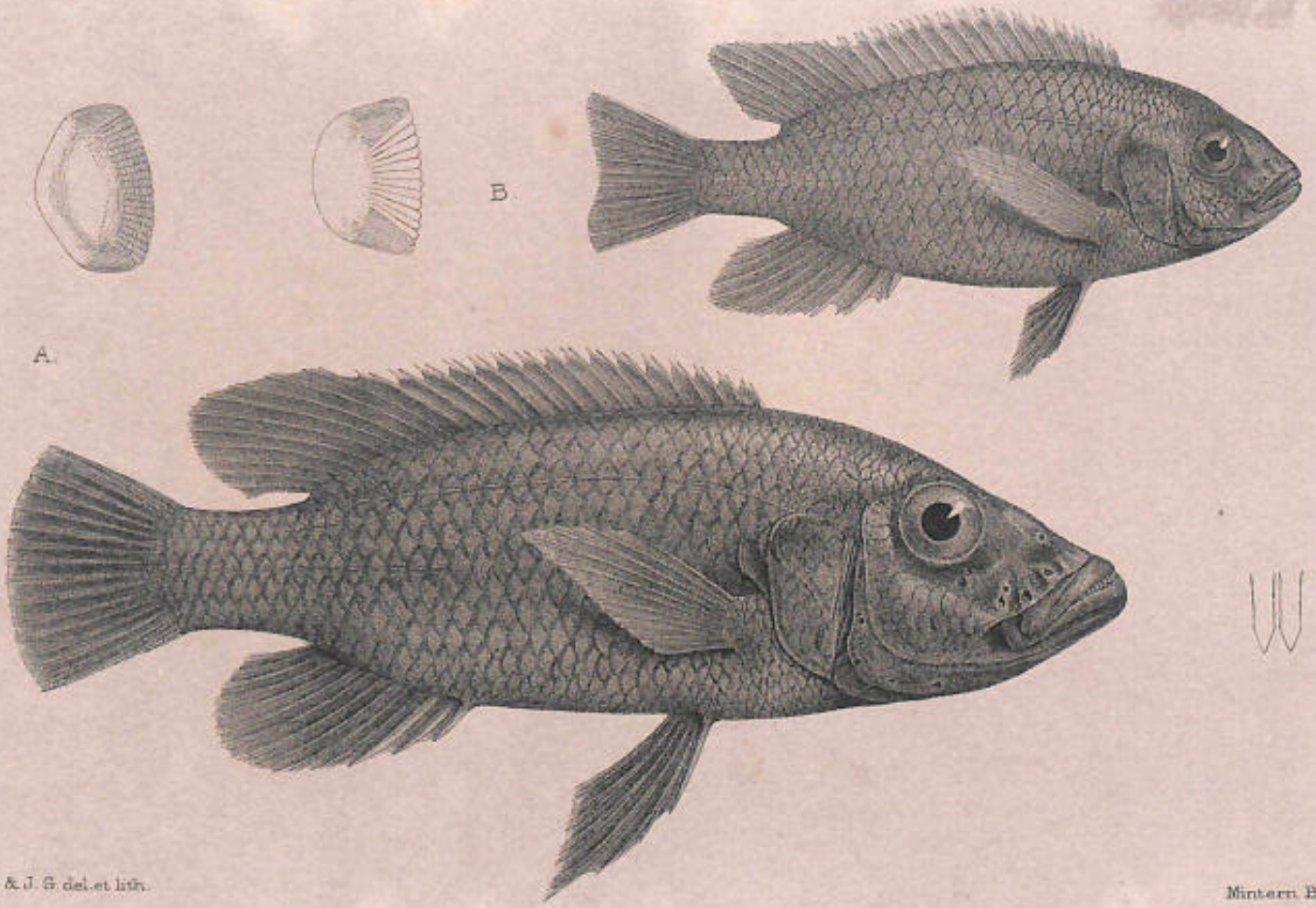
Mintern Bros. imp.

A. CHROMIS LETHRINUS. B. CHROMIS CALLIPTERUS.



R. Mintern & J. G. del. et lith. Mintern Bros. imp.

A. CHROMIS KIRKII. B. HEMICHROMIS LIVINGSTONII.
C. CHROMIS WILLIAMSI



R. Mintern & J. S. del. et lith.

Mintern Bros. imp.

A. HEMICHROMIS MODESTUS. B. HEMICHROMIS AFER.



Map of Southern Nyasaland.

from Mr. Johnston through Mr. Sclater. The Reptiles and Batrachians, having been collected in nearly the same localities as those of the first consignment, represent the same species which were described in the first Report, but with the addition of several others new to the Nyasa district. They will be enumerated below.

The most important portion, however, of this consignment consists of Fishes from Lake Nyasa. Since the year 1864, when I described the skins collected and prepared by Livingstone's companion, Sir J. Kirk (see P. Z. S. 1864, p. 303), nothing has been done to advance our knowledge of the Fish Fauna of this Lake. The only specimens which have reached me were collected in 1891 by the Rev. J. A. Williams, who kindly presented them to the British Museum; they are noticed in the present report. The specimens collected by Mr. Whyte, the naturalist attached to Mr. Johnston's staff[1], are unfortunately of small, many of very small size; but they reveal the remarkable fact, which has also been observed in much smaller freshwater areas, like Lake Tiberias, that the genera *Chromis* and *Hemichromis* are represented in the same river-basin not by one or two, but by a considerable number of species closely allied to, but readily distinguishable from, each other. To judge from the manner in which these fishes were distributed in the collecting-jars, the various species inhabit the same localities.

To the list of species already given in my former report the following have to be added:—

Chelonians: *Cyclanorbis frenatum* (Ptrs.); *Sternothærus sinuatus* (Smith).

Lizards: *Lygosoma sundevalli* (Smith); *Gerrhosaurus flavigularis* (Wiegm.); *Hemidactylus mabouia* (Moreau); *Chamæleon dilepis* (Gray); *Chamæleon melleri* (Gray).

Snakes: *Coronella olivacea*, var. *dumerilii* (Gthr.); *Dasypeltis scabra* (L.); *Psammophis sibilans* (L.); *Psammophis sibilans*, var. *intermedia* (Fisch.); *Ahætulla neglecta* (Ptrs.); *Dryiophis oatesii* (Gthr.); *Naja nigricollis* (Rnhdt.); *Causus rhombeatus* (L.); *Clotho rhinoceros* (Schleg.).

Batrachians: *Rana johnstoni*, sp. n.; *Cassina senegalensis*

[1] [Mr. Alexander Whyte, F.Z.S., who fills the post of Naturalist and Horticulturist under Mr. Johnston in the Central African Administration, is resident at Zomba, the seat of the Administration, which is situated on the south-east slope of Mount Zomba, close to the Mlungusi Stream, and is therefore in the watershed of Lake Shirwa, *not* in that of the Zambesi (see the article on Routes and Districts in Southern Nyasaland by Lieut. B. L. Sclater, R.E., in the 'Geographical Journal,' vol. ii. p. 419, Nov. 1893). In November 1892, Mr. Whyte accompanied H.B.M. Commissioner in a journey to Fort Johnston, which is situated on the east bank of the Upper Shiré, about two miles below its exit from Lake Nyasa. It was upon this occasion that the collection of Fishes described by Dr. Günther in the present paper was made, as I find by reference to his letters. Fort Johnston, Zomba, and most of the other localities from which Mr. Johnston's various collections have been received are shown in the map (p. 617), which has been reprinted (with emendations) from that in the 'Geographical Journal' for 1893, p. 249.—P. L. S.]

(Smith); *Arthroleptis macrodactyla* (Blgr.); *Rappia cinctiventris* (Cope, = *citrina*, Gthr.); *Rappia nasuta* (Gthr.).

Fishes: *Chromis squamipinnis* (Gthr.); *Chromis subocularis*, sp. n.; *Chromis johnstoni*, sp. n.; *Chromis lethrinus*, sp. n.; *Chromis tetrastigma*, sp. n.; *Chromis callipterus*, sp. n.[1]; *Chromis kirki*, sp. n.; *Chromis williamsi*, sp. n.[1]; *Hemichromis intermedius* (Gthr.); *Hemichromis modestus*, sp. n.; *Hemichromis livingstonii*, sp. n.; *Hemichromis afer*, sp. n.; *Hemichromis longiceps* (Gthr.); *Bagrus meridionalis*, sp. n.; *Synodontis zambesensis* (Ptrs.)[1]; *Alestes imberi* (Ptrs.); *Mormyrus discorhynchus* (Ptrs.)[1]; *Mormyrops zambanenje* (Ptrs.)[1]; *Haplochilus johnstoni*, sp. n.; *Labeo mesops*, Gthr.[2]; *Barbus trimaculatus* (Ptrs.)[3]; *Engraulicypris pinguis* (g. et sp. n.)[1].

This addition raises the number of species of fishes now known from Lake Nyasa and the Shiré River to thirty-three, but the number actually inhabiting these waters may be safely estimated at thrice that figure at the very least.

I subjoin descriptions of the new species, with some notes on others previously known.

Rhampholeon brachyurus, Gthr. P. Z. S. 1892, p. 557.

This species was described in the first report from a female; Mr. Johnston has now sent a male, which does not essentially differ from the opposite sex.

Rhampholeon platyceps, Gthr. P. Z. S. 1892, p. 556.

This species was also described in the first report from a female, which, besides, was mutilated. The male now sent shows that the tail is really as short as represented (in outline) in the figure given of this species. The male has a very small skinny lobe at the end of the snout, and about six distant and inconspicuous tubercular projections along the median ridge of the back. It was obtained at Tshiromo.

Rhampholeo boettgeri, Pfeffer, Zool. Ergebn. Reise Stuhlmann, 1893; Rept. p. 8, Taf. i. figs. 6 and 7, may prove to be the same species.

Psammophylax variabilis, Gthr. P. Z. S. 1892, p. 557.

This Snake must be very useful as a destroyer of mice; two had examples of *Mus dolichurus* in their stomachs.

Dasypeltis scabra, L.

Common. The series of scales vary from 23 to 27. I doubt the specific distinctness of *D. palmarum*.

[1] Obtained by the Rev. J. A. Williams.

[2] Caught in the Upper Shiré River.

[3] This species has a distinct, unserrated, osseous spine, much stronger than the rays and stronger than is figured by Peters, who had one specimen only from the Lower Zambesi.

Ahætulla neglecta (Ptrs.).

Specimens were collected at Zomba and Milanji. Two of them showed broad irregular brown cross-bands on the anterior fourth of the trunk. The ovary contained only five eggs, ready for exclusion. Feeds on frogs.

Naja nigricollis, Rnhrdt.

This species would seem to show an extraordinary range in the number of rows of scales counted somewhat before the middle of the trunk. Peters mentions the number of 27; I myself have counted 25, 23 (twice), 21, 19; and now a large specimen obtained by Mr. Crawshay at Lake Mweru, of which he preserved the skin, has only 17 of these rows. It is black above, but shows the black cross-band on the hinder part of the throat. The temporal scute is divided by suture from the adjoining labial, as is characteristic for *N. nigricollis* and *N. tripudians*. The posterior pair of intermentalia are entirely separated from each other by intervening scales. I propose for this remarkable variety (if it be not regarded as a species) the name of *crawshayi*.

Clotho rhinoceros, Schleg.

Skin of a young River-jack from Lake Mweru, collected by Mr. Crawshay.

Rana johnstoni, sp. n.

Vomerine teeth in two slightly oblique short series, extending to behind the level of the posterior margin of the choanæ. Head rather broad, with the snout obtusely rounded and rather short; canthus rostralis indistinct; interorbital space rather broader than the upper eyelid; tympanum indistinct, one third the size of the eye. Fingers moderate, the first not extending beyond the second; toes moderate, almost entirely webbed; a single very small inner metatarsal tubercle. The tibio-tarsal articulation reaches to between the eye and the end of the snout. Skin smooth. Upper parts either uniform blackish, or olive coloured and marbled with black; lower parts dusky, throat marbled with brown.

Distance of snout from vent 45 millimetres; distance of the angles of the mouth 16 millimetres; length of hind limb 80 millimetres; length of foot, including metatarsus, 35 millimetres; length of fourth toe 24 millimetres.

Two specimens, obtained at Tshiromo in the month of November.

Arthroleptis macrodactyla, Blgr.

The single specimen is not in a good state of preservation, and its reference to this Gaboon species therefore requires further confirmation.

Rappia nasuta, Gthr.

The type came from Angola, but there cannot be any doubt

about its identity with a well-preserved example in the Nyasa collection.

CHROMIS SQUAMIPINNIS. (Plate LIII. ad. et jr.)

Chromis squamipinnis, Günth. P. Z. S. 1864, p. 311.

D. $\frac{15-16}{10-11}$. A. $\frac{3}{9}$. L. lat. 33. L. transv. $\frac{4}{14}$.

Teeth very small, notched, brown at the tip, with the inner cusp longest; in young specimens about thirty-four, in old ones about forty on each side of the outer series of the upper jaw. Scales below the eye in two series; those of the body smooth and not ciliated. Forehead broad, flattish, its width being much more than the diameter of the eye. In old specimens the horizontal width of the præorbital equals the diameter of the eye, but is much less in young ones. The scaly part of the cheek is narrow, much narrower than the orbit. The two limbs of the præoperculum meet at a right angle. The height of the body is two fifths of the total length without caudal, the length of the head one third. The length of the longest dorsal spine equal to that of the postorbital portion of the head. Pectoral fin long, sometimes extending beyond the middle of the anal. Caudal densely covered with minute scales, which are visible even in young specimens. Greenish, shining silvery, with six or seven irregular black cross-bands, the foremost in the middle of the neck, the last on the free portion of the tail; the band below the origin of the soft dorsal is frequently continued into a spot on that fin.

This species seems to be the most common. I first described it from skins collected by Sir John Kirk, of which the largest was 12 inches long; Mr. Whyte now sends some specimens from 3 to 4 inches long.

The figure of the adult specimen is reduced to $\frac{2}{3}$ the natural size.

CHROMIS SUBOCULARIS. (Plate LIV. fig. B.)

D. $\frac{15}{10}$. A. $\frac{3}{8}$. L. lat. 30. L. transv. $\frac{2\frac{1}{2}}{10}$.

Teeth deeply bicuspid, with the inner cusp longest; brown at the tip in a specimen 4½ inches long; *twenty-three* on each side of the outer series of the upper jaw. Scales below the eye in three series. The diameter of the eye exceeds the width of the præorbital and the width of the interorbital space, which is flat, but is nearly equal to the depth of the scaly portion of the cheek. The two limbs of the præoperculum meet at nearly a right angle. The height of the body is nearly equal to the length of the head and one third of the total without caudal; the longest dorsal spine is the last, and less than one half of the length of the head. Pectoral fin extending to the origin of the anal. Scales smooth. Body with seven blackish cross-bands, which are rather irregular and do not descend to the lower half of the body; the first is in front of the dorsal and the last two on the caudal peduncle; a short black

streak from the eye to the angle of the mouth; the soft dorsal and caudal with alternate darker and lighter spots between the rays; anal not coloured.

Very young specimens, from 2 to $3\frac{1}{2}$ inches long, have the body of uniform coloration, but the suborbital band is present.

The largest specimen is $4\frac{1}{2}$ inches long.

Chromis johnstoni, sp. n. (Plate LIV. fig. A.)

D. $\frac{16}{10}$. A. $\frac{3}{8-9}$. L. lat. 30. L. transv. $\frac{4}{10}$.

Teeth distinctly bicuspid, with the inner cusp longest, brown at the tip in a specimen $4\frac{3}{4}$ inches long; *thirty* on each side of the outer series of the upper jaw. Scales below the eye in three series. The diameter of the eye equals the width of the præorbital and the depth of the scaly portion of the cheek, but exceeds the width of the interorbital space, which is convex. The angle formed by the præopercular limbs is very obtuse. The height of the body is nearly equal to the length of the head and one third of the total. The longest dorsal spine is the last, and less than one half of the length of the head. Pectoral fin extending to the origin of the anal. Scales smooth. Body with six blackish cross-bands, which descend to the lower half of the body; the first is in front of the dorsal, the fifth below the end of the dorsal, and the last on the caudal peduncle; a short black streak from the eye to the angle of the mouth; dorsal and caudal fins chequered with darker and lighter spots.

Only one specimen is sent, $4\frac{3}{4}$ inches long.

Chromis lethrinus, sp. n. (Plate LV. fig. A.)

D. $\frac{15}{10}$. A. $\frac{3}{8}$. L. lat. 33. L. transv. $\frac{3\frac{1}{2}}{10}$.

Teeth very small, each with two short, subequal, brownish cusps; thirty-seven on each side of the outer series of the upper jaw. Scales below the eye in three series. The diameter of the eye is less than the width of the præorbital and equal to the depth of the scaly portion of the cheek and to the width of the interorbital space, which is flat. The angle formed by the præopercular limbs is nearly a right one. The height of the body is nearly equal to the length of the head and rather more than one third of the total (without caudal). The longest dorsal spine is the last and less than one half of the length of the head. Pectoral fin extending a little beyond the origin of the anal. Caudal covered with minute scales. Scales smooth. Body with a straight blackish longitudinal band running from the eye above the caudal portion of the lateral line; back with transverse blackish spots; dorsal fin with oblique blackish bands; caudal and anal without ornamentation.

Only one specimen is sent, $5\frac{3}{4}$ inches long.

CHROMIS TETRASTIGMA, sp. n. (Plate LIV. fig. C.)

D. $\frac{15}{10}$. A. $\frac{3}{8}$. L. lat. 30. L. transv. $\frac{3\frac{1}{2}}{10}$.

Teeth distinctly bicuspid, brown at the tip, the inner cusps being larger than the outer; from twenty-eight to thirty-two on each side of the outer series of the upper jaw. Scales below the eye in three series. In a specimen $4\frac{1}{2}$ inches long the diameter of the eye exceeds the width of the præorbital, the depth of the scaly portion of the cheek, and the width of the interorbital space, which is flat. The angle formed by the præopercular limbs is nearly a right one. The height of the body is rather more than the length of the head, which is one third of the total (without caudal). The length of the last dorsal spine is two fifths of that of the head. Pectoral fin extending to the origin of the anal. The upper and lower caudal rays covered with scales. Scales smooth. A series of four large black spots on the body—the first on the operculum, the second on the lateral line opposite to the ninth and tenth dorsal spines, the third on the beginning of the lower lateral line, the fourth on the root of the caudal fin. Vertical and ventral fins blackish, the dorsal with numerous ocelli.

Several specimens, of which the largest is $4\frac{1}{2}$ inches long, are sent from Zomba and from Fort Johnston.

CHROMIS CALLIPTERUS, sp. n. (Plate LV. fig. B.)

D. $\frac{14}{9}$. A. $\frac{3}{7}$. L. lat. 27–28. L. transv. $\frac{4-5}{10}$.

Teeth distinctly bicuspid, the cusps being short, subequal, and brownish; from twenty-seven to thirty-two (in very young specimens twenty-two) teeth on each side of the outer series of the upper jaw. Scales below the eye in three series. In a specimen $5\frac{1}{2}$ inches long the diameter of the eye equals the width of the præorbital and of the interorbital space, but is a little less than the depth of the scaly portion of the cheek. The angle formed by the præopercular limbs is a right one. The height of the body is rather more than the length of the head, which is one third of the total (without caudal). The longest dorsal spine is the last and rather less than one half of the length of the head. Pectoral fin extending to the origin of the anal; caudal more or less scaleless. Scales roughened, with minute projections on the margin. Body dark-coloured, with the vertical fins blackish, the anal being ornamented by a series of large milky-white ocelli from two to four in number; in our largest specimen also the dorsal fin is ornamented with round light-coloured spots. A black band running from the eye to the angle of the mouth seems to be constant.

The largest specimen is $5\frac{1}{2}$ inches long, and was sent by the Rev. J. A. Williams; smaller specimens from Zomba are in the Johnston collection.

CHROMIS KIRKII, sp. n. (Plate LVI. fig. A.)

D. $\frac{15}{9}$. A. $\frac{3}{8}$. L. lat. 29. L. transv. $\frac{5}{10}$.

Teeth distinctly bicuspid, each with two subequal brownish cusps, from seventeen to nineteen on each side of the outer series of the upper jaw. Scales below the eye very thin, in three rather irregular series. In a specimen 4½ inches long the diameter of the eye is rather more than the width of the præorbital or than the depth of the scaly portion of the cheek, but equal to the width of the interorbital space, which is flat. The angle formed by the præopercular limbs is an obtuse one. The height of the body is two fifths the length of the head, one third of the total (without caudal). The longest dorsal spine is not quite one half of the length of the head. Pectoral fin extending to, or a little beyond, the origin of the anal fin. Caudal fin covered with minute scales. Scales rough, with minute projections on the margin. A rather narrow straight black stripe runs from the opercular spot to the end of the lateral line; another similar band, but broken up into spots, runs along the side of the back, and is absent in very young individuals. The soft dorsal with oblique, alternate, lighter and darker bands. No band across the præorbital.

Several specimens, the largest being 4½ inches in length.

CHROMIS WILLIAMSI, sp. n. (Plate LVI. fig. C.)

D. $\frac{17}{8}$. A. $\frac{3}{7}$. L. lat. 28. L. transv. $\frac{7}{12}$.

Teeth deeply bicuspid, brown at the tip, the inner cusps being much larger than the outer; twenty-six or twenty-seven on each side of the outer series of the upper jaw. Scales below the eye in four series; the scales on the neck between the anterior dorsal spines and the beginning of the lateral line are remarkably small. In a specimen 4⅓ inches long the diameter of the eye exceeds the width of the præorbital, is equal to the depth of the scaly portion of the cheek and less than the width of the interorbital space, which is rather convex. The angle formed by the præopercular limbs is a right one. The height of the body is a little more than the length of the head, which is one third of the total (without caudal). The length of the last dorsal spine is less than one half of that of the head. Pectoral fin not quite reaching the vent; caudal fin covered with scales. Scales rough, without spines on the margin. Body nearly uniform dark-coloured, with a black spot on the end of the operculum, and another at the root of the caudal fin; vertical fins blackish, the dorsal with a broad black margin and the anal with a small milky-white spot between the fifth and sixth rays.

A single specimen, 4⅓ inches long, obtained by the Rev. J. A. Williams.

HEMICHROMIS MODESTUS, sp. n. (Plate LVII. fig. A.)

D. $\frac{16}{10}$. A. $\frac{3}{9}$. L. lat. 29. L. transv. $\frac{5}{12}$.

All the teeth are conical, only one or two showing traces of an additional cusp, thirty-four on each side of the outer series of the upper jaw. Scales below the eye in four rather irregular series; scales on the neck and below the anterior dorsal spines much smaller than those of the body. In a specimen 6 inches long the diameter of the eye equals the width of the præorbital and the depth of the scaly portion of the cheek, but is less than the width of the interorbital space, which is convex. The angle formed by the præopercular limbs is a right one. Snout considerably produced, with the lower jaw strongly projecting beyond the upper, rather longer than the postorbital portion of the head. The height of the body is less than one third, the length of the head considerably more than one third of the total length (without caudal). Dorsal spines rather short, of moderate strength, the longest being one third of the length of the head. Pectoral fin reaching to the vent. Body uniform brownish black, fins black.

Some of the gill-rakers are T- or hammer-shaped.

A single specimen, 6 inches long, was obtained by the Rev. J. A. Williams.

HEMICHROMIS LIVINGSTONII, sp. n. (Plate LVI. fig. B.)

D. $\frac{16}{10}$. A. $\frac{3}{9}$. L. lat. 32. L. transv. $\frac{7}{12}$.

Teeth conical, but a few show traces of an additional cusp, twenty-six on each side of the outer series of the upper jaw. Scales below the eye very thin, in five rather irregular series; those on the neck and anterior part of the back much smaller than those of the body. In a specimen 5 inches long the diameter of the eye is less than the depth of the scaly portion of the cheek, but equals the width of the præorbital and of the interorbital space, which is convex. The angle formed by the præopercular limbs is a right one. Snout moderately produced, equal to the postorbital portion of the head, the lower jaw projecting but little beyond the upper. The height of the body is a little less than the length of the head, which is nearly one third of the total (without caudal). Dorsal spines of moderate strength and length, the longest being two fifths of the length of the head. Pectoral fin reaching to the anal. Body largely and irregularly marbled with black and silvery; head ornamented with several black bands, one from the eye to the angle of the mouth, merging into the black coloration of the lower parts, another band from the eye over the operculum, a third across the forehead, and a fourth across the foremost part of the neck; dorsal and caudal marbled with lighter and darker, ventral and anal black.

None of the gill-rakers are hammer-shaped.

A single specimen, 5 inches long, is in the Johnston collection.

Hemichromis afer, sp. n. (Plate LVII. fig. B.)

D. $\frac{16}{9}$. A. $\frac{3}{8}$. L. lat. 30. L. transv. $\frac{5}{10}$.

Teeth conical, eighteen on each side of the outer series of the upper jaw. Scales below the eye in four rather irregular series; those on the neck and anterior part of the back much smaller than those of the body. In a specimen 4 inches long the diameter of the eye equals the width of the præorbital and the depth of the scaly portion of the cheek, but is less than the width of the interorbital space, which is convex. The angle formed by the præopercular limbs is a right one. Snout short and obtuse, shorter than the postorbital portion of the head, the lower jaw not projecting beyond the upper. The height of the body is somewhat more than the length of the head and equal to one third of the total (without caudal). Dorsal spines of moderate strength and length, the longest being about two fifths of the length of the eye. Pectoral fin reaching to the vent. Body uniform more or less dark brown, a spot on the end of the opercle and all the fins deep black.

Gill-rakers short, some of them T- or hammer-shaped.

Two specimens, the longer 4 inches long, were collected by the Rev. J. A. Williams.

Bagrus meridionalis, sp. n.

This species is closely allied to *B. bayad*, agreeing with this Nilotic form in the shape and configuration of the head and the number of fin-rays, but the dorsal and pectoral spines are much weaker, scarcely stronger than the rays; the maxillary barbels are shorter, only about as long as the head; and the adipose fin occupies a much shorter space of the back, its distance from the dorsal fin being equal to the length of the latter.

The dry skin of a specimen 22½ inches long has been sent by Mr. Johnston from the Upper Shiré River; of course, it would occur also in the Lake itself, and it probably reaches to a very considerable size, like its congeners.

Engraulicypris, g. n. Cyprin.

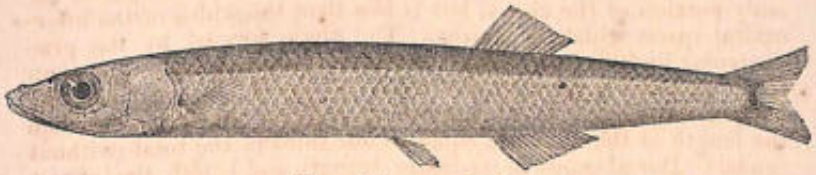
Shape of the head and body elongated, cylindrical like that of an Anchovy. Scales of moderate size, deciduous. Lateral line? Dorsal fin short, with less than nine branched rays, opposite to the commencement of the anal. Anal fin with about fourteen rays. Snout compressed, with the mouth of moderate width, lateral; the upper jaw almost entirely hidden below the large præorbital. Suborbitals covering nearly the entire cheek. Gill-rakers very slender. Pharyngeal teeth in a double series, pointed.

Engraulicypris pinguis, sp. n.

D. 11. A. 14. L. transv. 9 or 10.

Body very low, subcylindrical, its depth being one seventh or one eighth of the total length without caudal; the length of the

head is contained four times and one third in it. Eye large, shorter than the snout, and one fourth of the length of the head, occupying a position somewhat anterior to the middle of the head, The snout is pointed, with the mouth resembling that of a Clupeoid, the jaws having sharp margins, but being toothless; lower jaw not projecting when the mouth is closed, but provided with a short symphysial hook; bones of the suborbital ring, and particularly the præorbital, dilated. Head flat above; interorbital space rather



Engraulicypris pinguis.

narrower than the orbit. All the fins are short and feeble. The ventrals inserted somewhat nearer to the root of the caudal fin than to the end of the snout. The first dorsal ray is somewhat in advance of the first anal ray and nearer to the root of the caudal than to the gill-opening. Caudal emarginate.

All the scales are lost, but from the impressions of the skin it would appear that there are nine or ten scales in a transverse series below the origin of the dorsal fin.

Back dark bluish green, this colour being sharply defined from the silvery of the sides and lower parts; sides of the head bright silvery. The middle of the caudal fin is blackish with whitish centre.

Two specimens, 4 inches long, in bad condition, are sent by the Rev. J. A. Williams. I cannot help thinking that this fish, if it occurs in any great numbers and is easy of capture, might be preserved in a way similar to Anchovies and would form a useful addition to the food of the European community.

HAPLOCHILUS JOHNSTONI, sp. n.

D. 7. A. 12–13. L. lat. 29. L. transv. 7.

The height of the body is one fourth or one fifth of the total length, without caudal; the length of the head a little less than one fourth. Head compressed; snout somewhat depressed; lower jaw projecting beyond the upper. The width of the interorbital space is less than one half of the length of the head. The diameter of the eye equals the length of the snout, and is a little less than one third of the length of the head. The origin of the dorsal fin is twice as distant from the eye as from the root of the caudal, and corresponds to the seventeenth scale of the lateral line or to the ninth anal ray. Pectoral fin extending beyond the root of the ventral. None of the fins elongate. Coloration of specimens in spirit uniform reddish olive; a fine bluish line runs along the scales of the lateral line.

Several specimens are sent from Fort Johnston; they were collected in November; their length is from 18 to 20 lines.

Allied to *Haplochilus petersi* (Sauvage), but differing in various particulars.

EXPLANATION OF THE PLATES.

PLATE LIII.

Chromis squamipinnis, p. 621.

PLATE LIV.

Fig. A. *Chromis johnstoni*, p. 622.
B. *Chromis subocularis*, p. 621.
C. *Chromis tetrastigma*, p. 623.

PLATE LV.

Fig. A. *Chromis lethrinus*, p. 622.
B. *Chromis callipterus*, p. 623.

PLATE LVI.

Fig. A. *Chromis kirki*, p. 624.
B. *Hemichromis livingstonii*, p. 625.
C. *Chromis williamsi*, p. 624.

PLATE LVII.

Fig. A. *Hemichromis modestus*, p. 625.
B. *Hemichromis afer*, p. 626.

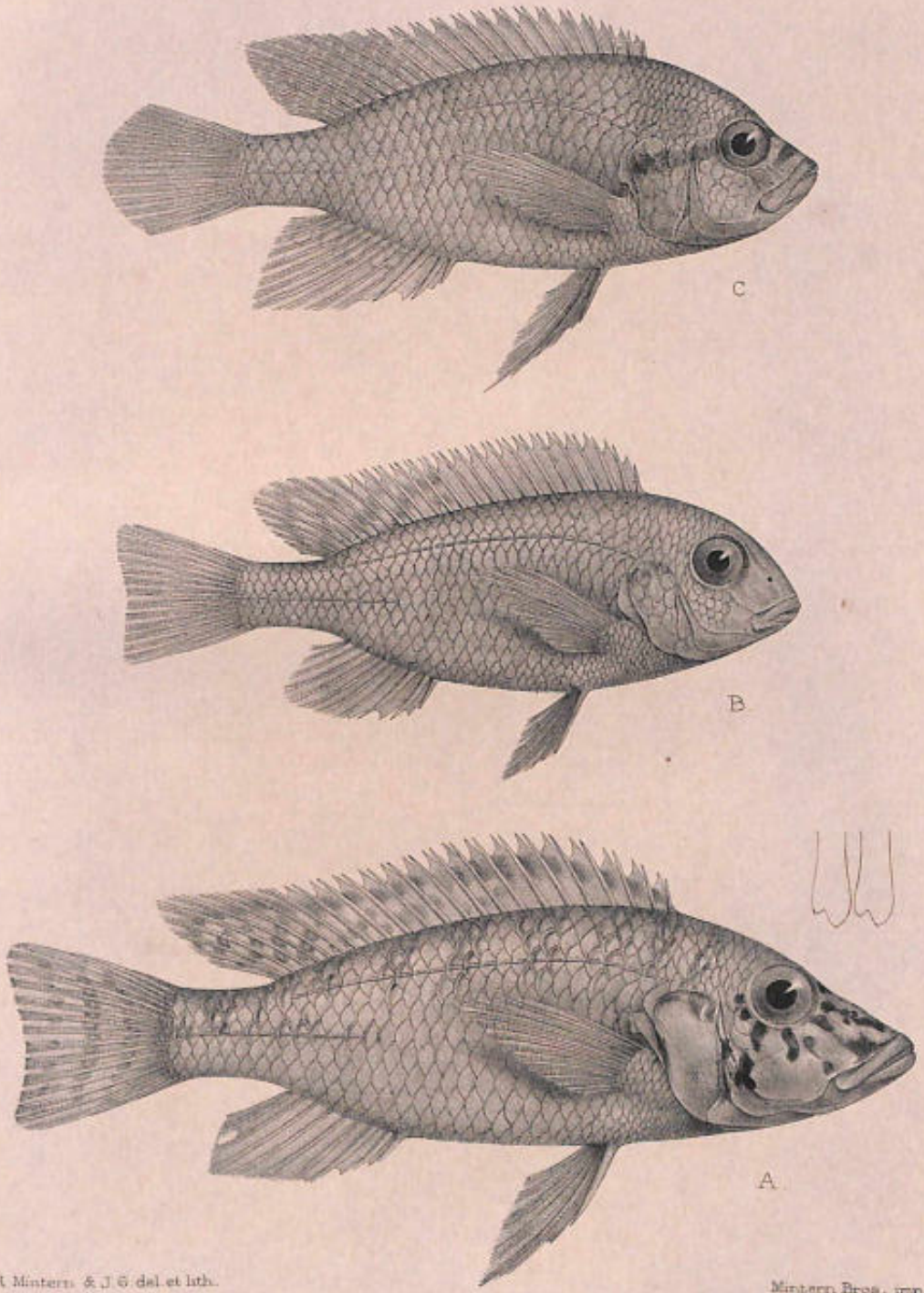
2. Descriptions of the Reptiles and Fishes collected by Mr. E. Coode-Hore on Lake Tanganyika. By Dr. A. GÜNTHER, F.R.S., V.P.Z.S.

[Received November 7, 1893.]

(Plate LVIII.)

Mr. Coode-Hore, who was resident for several years on the shores of Lake Tanganyika, brought home in 1889 a small collection of Snakes and Fishes. The specimens had greatly suffered during the long voyage to England, but some of them were in a sufficiently good state of preservation to be acquired for the British Museum and to be described here. I have deferred an account of them in the hope of seeing them supplemented by subsequent collections; but as it seems desirable to work them out in comparison with those from Lake Nyasa and other parts of Eastern Equatorial Africa, I will not allow the present occasion to pass without giving an account of them.

The discovery of two species of *Mastacembelus*, connecting the Asiatic species with the West African, is only one of the interesting facts which a more extended investigation of the Fish-fauna of this remarkable lake is sure to reveal.



R. Mintern & J. G. del. et lith.

Mintern Bros. imp.

CHROMIS.

A. CH. HOREI. B. CH. DIAGRAMMA. C. CH. BURTONI.

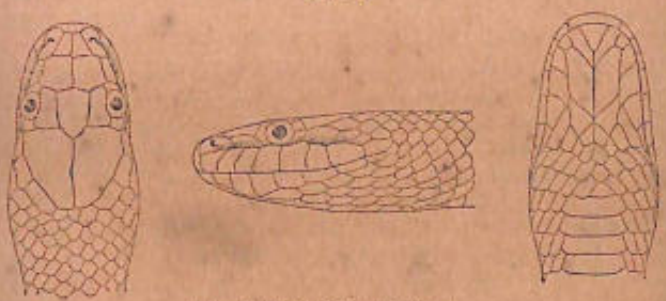
GLYPHOLYCUS, g. n. Lycodont.

Allied to *Boodon*, but with the dentition of *Lamprophis*, the maxillary teeth (about eighteen in number) being placed in a continuous series, and the anterior and middle ones being longer and stronger than the posterior; anterior mandibulary teeth stronger than the following. Sides of the head with a deep longitudinal groove or fold which separates the series of upper labials from the shields above. Head rather small and depressed; eyes small, with round pupil; body not compressed; scales smooth, in twenty-one or twenty-three rows; anal entire; subcaudals in two rows; nasal semi-divided; one loreal; anterior frontals pointed in front.

GLYPHOLYCUS BICOLOR, sp. n.

Vertical shield rather small, not much larger than the supra-ocular; occipital as long as the vertical and posterior frontal together; eight upper labial shields, of which the fourth enters the orbit; rostral shield reaching the upper surface of the head; loreal elongate, one anterior ocular not reaching the upper surface

Fig. 1.



Head of *Glypholycus bicolor*.

of the head; two posterior oculars; temporals 1+2+3; ventrals 163; subcaudals 56–72. Upper parts uniform brownish lead-coloured; lower parts and the two outer series of scales whitish; a brownish line along the meeting edges of the subcaudals.

Several specimens, of which one measures 26 inches, the tail taking $5\frac{1}{2}$.

MASTACEMBELUS TANGANICÆ, sp. n.

D. 33/56. C. 12. A. 2/61.

Trunk and tail short and compressed, its greatest depth being contained twice and a fourth in the length of the head. Rostral appendage very short. Vertical fins continuous, the length of the tail being but little more than two fifths of that of the head and trunk together.

Dorsal spines short, the distance of the foremost from the operculum being scarcely half the length of the head. Length of

the head one third of that of the trunk. Coloration either uniform brownish, or light coloured with numerous narrow brown cross-bands.

Several specimens, not in a good state of preservation, of which the largest is $6\frac{1}{2}$ inches long.

MASTACEMBELUS OPHIDIUM, sp. n.

D. 31–32/103. C. 7. A. 1/116.

Body exceedingly slender, subcylindrical, its depth being one third of the length of the head. Rostral appendage very short. Vertical fins continuous, the vent being much nearer to the end of the snout than to the caudal fin. Dorsal spines short and feeble, the distance of the foremost from the operculum being only half the length of the head. Length of the head one third of that of the trunk. Scales minute. Coloration apparently uniform brownish.

Several specimens, not in a good state preservation, of which the largest is $11\frac{1}{2}$ inches long.

CHROMIS HOREI, sp. n. (Plate LVIII. fig. A.)

D. $\frac{16}{8}$. A. $\frac{3}{8}$. L. lat. 28. L. transv. $\frac{4}{9}$.

Teeth distinctly bicuspid, the cusps being subequal and slightly tinged with brown; from twenty-eight to thirty-one on each side of the outer series of the upper jaw. Cheeks naked or only with a few extremely thin scales. In a specimen nearly 5 inches long the diameter of the eye is nearly equal to the depth of the soft part of the cheek and a little less than the width of the præorbital and of the interorbital space, which is flat. The angle formed by the præopercular limbs is a right one. The height of the body is somewhat less than the length of the head and one third of the total (without caudal). The longest dorsal spine is the last and is two fifths of the length of the head. Pectoral fin extending to, or nearly to, the origin of the anal. Caudal scaleless. Scales rough, some with the margins ciliated. Body light greenish, with more or less conspicuous incomplete brownish cross-bands on the upper part of the body. The largest specimen has the cheek and snout ornamented with irregular deep brown spots; the soft dorsal and the caudal fin with scattered ocelli; a milky-white spot between the last two anal rays.

Three specimens, the largest $4\frac{3}{4}$ inches long.

CHROMIS TANGANICÆ, sp. n.

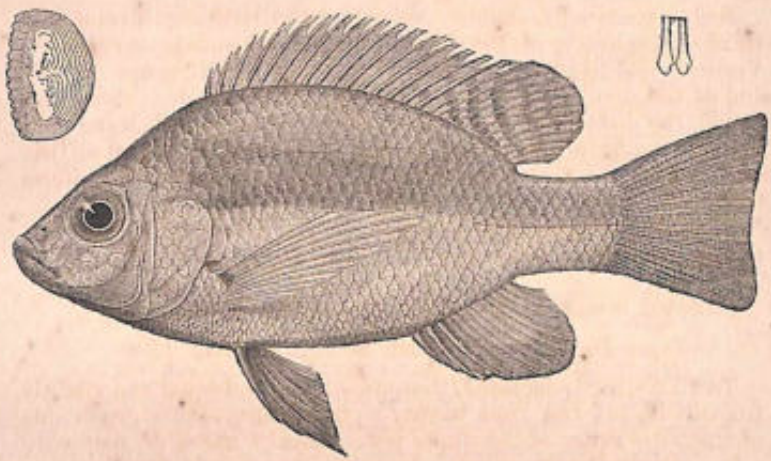
D. $\frac{16}{11-12}$. A. $\frac{3}{9-10}$. L. lat. 32. L. transv. $\frac{4}{6 \text{ \& } 1 \text{ small ones.}}$

Allied to *C. squamipinnis*.

Teeth small, with an obliquely dilated and notched apex; thirty on each side of the outer series of the upper jaw; scales below the eye in three series; in a specimen nearly 4 inches long the diameter of the eye exceeds the width of the præorbital and the depth

of the scaly portion of the cheek, but is less than the width of the interorbital space, which is nearly flat. The two limbs of the præoperculum meet at a right angle; the height of the body is contained twice and a fourth in the total (without caudal), the length of the head twice and four fifths; the longest dorsal spine

Fig. 2.



Chromis tanganicæ.

is less than one half of the length of the head. Caudal scaleless. Pectoral fin extending beyond the origin of the anal. Scales with concentric rough undulating ridges. Coloration uniform greenish with silvery reflections.

Three specimens.

CHROMIS BURTONI, sp. n. (Plate LVIII. fig. C.)

D. $\frac{14}{11}$. A. $\frac{3}{9}$. L. lat. 27. L. transv. $\frac{3\frac{1}{2}}{9}$.

Teeth small, each with a small outer cusp, twenty-eight on each side of the outer series of the upper jaw. Scales below the eye in four or five series. In a specimen nearly 4 inches long the diameter of the eye equals the width of the præorbital and of the interorbital space, which is slightly convex transversely, but has a concave longitudinal profile; the depth of the scaly portion of the cheek is distinctly more than the width of the orbit. The angle formed by the præopercular limbs is a right one. The height of the body is rather more than the length of the head, which is one third of the total (without caudal). The length of the last dorsal spine is two fifths of that of the head; caudal with convex

posterior margin; pectoral fin extending to the origin of the anal. Scales rough, apparently uniform greenish, with a blackish spot on the end of the operculum; two narrow blackish bars across the upper surface of the snout; the soft dorsal with a row of rounded darker spots behind each ray.

One specimen.

CHROMIS DIAGRAMMA, sp. n. (Plate LVIII. fig. B.)

D. $\frac{17-18}{10}$. A. $\frac{3}{7}$. L. lat. 30. L. transv. $\frac{8\frac{1}{2}}{7 \text{ \& } x \text{ very small ones.}}$

This species has the upper profile of the head descending in a curve, reminding one of *Diagramma*. Teeth bicuspid, the inner cusp being the longer and brown; twenty-eight on each side of the outer series of the upper jaw. Scales below the eye in four series. In a specimen $3\frac{3}{4}$ inches long the diameter of the eye equals the width of the præorbital and the depth of the scaly portion of the cheek, but is less than the width of the interorbital space, which is convex. The angle formed by the præopercular limbs is a right one. The height of the body is rather more, and the length of the head less, than one third of the total (without caudal). The length of the last dorsal spine is two fifths of that of the head; caudal scaleless, with vertical posterior margin; pectoral fin extending to or nearly to the origin of the anal. Scales rough, with minute spines on the margin. The coloration seems to be uniform greenish, in the smaller specimens with indistinct narrow darker cross-bands.

Three specimens, the largest of which is $3\frac{3}{4}$ inches long.

EXPLANATION OF PLATE LVIII.

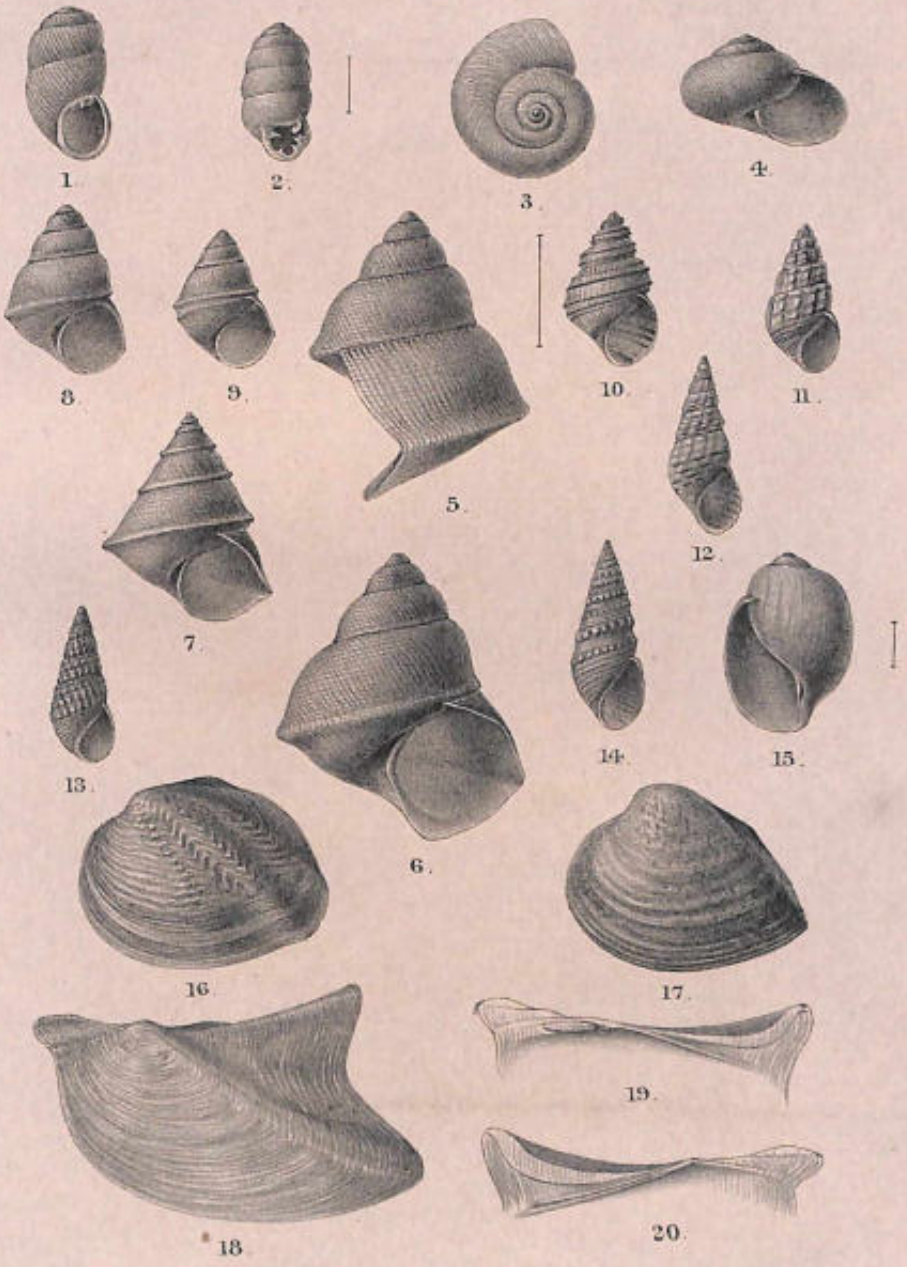
Fig. A. *Chromis horei*, p. 630.
B. *Chromis diagramma*, p. 632.
C. *Chromis bartoni*, p. 631.

3. On a Collection of Land and Freshwater Shells transmitted by Mr. H. H. Johnston, C.B., from British Central Africa. By EDGAR A. SMITH.

[Received August 28, 1893.]

(Plate LIX.)

The specimens comprised in this collection were obtained partly by Mr. R. Crawshay at Lake Mweru, Lake Tanganyika, and on the northern part of Lake Nyasa, and partly by Mr. A. Whyte at the southern end of the last-mentioned lake. They have been presented to the British Museum by H. H. Johnston, Esq., C.B., H.M. Commissioner in British Central Africa, to whom that insti-



J. Green del. et lith.

Mintern Bros. imp.

SHELLS FROM BRITISH CENTRAL AFRICA.

tution has been indebted on previous occasions for valuable collections from the Cameroons and the neighbourhood of Mount Kilimanjaro.

The most interesting specimens of the present collection are those obtained at Lake Mweru, a locality from which no Mollusca have as yet been recorded. This lake lies to the south-west of Lake Tanganyika, with which, however, it has no connection, as would be presumed by the difference of the Molluscan faunas so far as they are at present known. All the species from Lake Mweru are undescribed with one exception, and this appears to be a dead worn example of *Lanistes ovum*. The other species include two forms of *Viviparus*, two *Cleopatræ*, three *Melaniæ*, a very remarkable winged *Unio*, and examples of two or three other species of that genus, but represented by specimens too young or too worn to be determined.

Forms of all these genera occur in Tanganyika, and one of the species belongs to that group of *Viviparus* which, characterized by the aperture being somewhat effuse anteriorly and the outer lip sinuated, was described by the writer in these 'Proceedings' for 1880 as a new genus from Tanganyika, under the name of *Neothauma*.

1. Ennea johnstoni. (Plate LIX. fig. 1.)

Testa elongata, cylindracea, crassiuscula, rimata, flavo-viridis, parum nitida; anfractus 6, *convexiusculi, oblique fortiter striati, superiores quatuor regulariter crescentes, ultimus et penultimus longe majores, ultimus elongatus, supra aperturam lævior et subcomplanatus, primo peroblique descendens, sed ad labrum breviter ascendens; spira obtusissima; sutura mediocriter profunda; apertura subovata, intus sordide albida, longit. totius* ⅓ *paulo superans, denticulo unico parietali munita; peristoma album, incrassatum, anguste reflexum, marginibus callo crassiusculo junctis.*

Longit. 20 *millim., diam.* 10; *apertura* 8 *longa,* 5⅔ *lata.*

Hab. Fort Johnston, Upper Shiré River (*A. Whyte*).

This interesting shell is quite unlike any other known species, but recalls the form of some of the Mauritian *Gonospiræ*, e. g. *G. modiolus*, Férussac, although the relative proportion of the whorls is quite different. The oblique striæ are distinct and thread-like, but less observable upon the body-whorl above the aperture, where the surface has a faintly flattened appearance. With this species I have associated the name of H. H. Johnston, Esq., the spirited Commissioner of this Country in British Central Africa, and the donor to the Museum of the specimens.

2. Ennea karongana. (Plate LIX. fig. 2.)

Testa cylindracea, rimata, alba, nitida; anfractus 7, *lente accrescentes, læves, leviter convexiusculi, sutura profunda vix obliqua sejuncti; spira cylindrica, ad apicem obtuse conica; anfr. ultimus antice haud descendens vel ascendens, pone labrum profunde*

indentatus; apertura irregularis, longit. totius $\frac{3}{10}$ subæquans, dentibus quinque albis (uno parietali lamelliformi valde prominente, uno columellari crasso æque prominente, tertio infra columellarem minimo, quarto et quinto intra labrum sitis, quinto bidentato) munita; peristoma album, leviter expansum et incrassatum.

Longit. 8$\frac{3}{5}$ *millim., diam.* 4; *apertura* 2$\frac{1}{2}$ *longa.*

Hab. Karonga, west shore of Lake Nyasa (*R. Crawshay*).

This species exhibits scarcely any trace of sculpture. The indentation on the body-whorl behind the lip indicates the position of the labral teeth. The upper one of these is planted somewhat obliquely and is distinctly bipartite. The parietal lamella is thin, hollowed out or concave on the right side or towards the labrum, which it practically touches at the upper extremity.

3. Helix (Pella) whytei. (Plate LIX. figs. 3, 4.)

Testa depresse globosa, anguste perforata, tenuis, flavo-virescens, superne vix nitida, infra polita; anfractus 5$\frac{1}{2}$, *subceleriter crescentes, convexi, lineis incrementi oblique arcuatis sculpti; spira brevis, conica, ad apicem subobtusa; anfr. ultimus magnus, ad peripheriam rotundatus; apertura late lunaris, parum obliqua; sutura mediocriter profunda, anguste marginata; peristoma undique tenue, supra umbilicum breviter reflexum.*

Diam. maj. 20 *millim., min.* 16$\frac{1}{2}$; *alt.* 13.

Hab. Fort Johnston, Upper Shiré River. (Collected by Mr. A. Whyte.)

Allied to *Pella arnotti*, Benson, but more globose and without the minute spiral striation on the upper surface.

All the specimens, about thirty, have been collected without the living animal, and in this condition most of them have the spire more or less bleached. In addition to the lines of growth, occasionally a few spiral lineations are observable, and a few small malleations or indentations make the upper surface more or less uneven.

4. Livinhacia nilotica, Pfeiffer.

Hab. Angoni-Land, south-west of Lake Nyasa (*A. Whyte*): Itawa, west of Lake Tanganyika (*R. Crawshay*).

This species has a wide range, extending from the White Nile district along the lake-region as far south as the southern end of Nyasa, a distance of from fifteen to eighteen hundred miles. It varies considerably in form.

5. Buliminus (Rachis) stictus, Martens.

Hab. Angoni-Land (*A. Whyte*). Tette, Mozambique (*Martens*). A single typical example.

6. Limicolaria martensiana, Smith.

Hab. Sumbu, Itawa, S.W. of Tanganyika (*R. Crawshay*).

7. ACHATINA sp. inc.

Hab. Angoni-Land (*A. Whyte*).

A number of specimens of two species of *Achatina* occur in the collection; they are all, however, in too bad a condition for identification. One is very like *A. tavaresiana*, Morelet, from Angola; the other is considerably larger and rather like the form of Reeve's figure of *A. fulica* (Conch. Icon. pl. 2. f. 8).

8. AMPULLARIA OVATA, Olivier.

Hab. Sumbu, Itawa, S.W. side of Lake Tanganyika (*R. Crawshay*).

This Nilotic species has already been recorded from the lake (P. Z. S. 1880, p. 348).

9. LANISTES SOLIDUS, Smith.

Hab. Karonga, west shore of Lake Nyasa (*R. Crawshay*).

One dead specimen.

10. LANISTES AFFINIS, Smith.

Hab. With the preceding (*Crawshay*); Angoni-Land (*Whyte*).

In dead condition from Karonga. The large number of specimens from Angoni-Land are all small or only half-grown.

11. LANISTES NYASSANUS, Dohrn.

Hab. Angoni-Land, south-west end of Lake Nyasa (*A. Whyte*).

The eight specimens of this fine species are all in a worn condition and were evidently picked up dead upon the shore.

12. LANISTES OVUM (Peters MS., Troschel).

Hab. Kabwiri, Lake Mweru (*R. Crawshay*).

This species was originally described from Mozambique, and although quoted from Lake Nyasa I have not yet seen specimens from there myself.

13. VIVIPARUS TANGANYICENSIS (Smith).

Hab. Sumbu, Itawa, S.W. end of Lake Tanganyika (*R. Crawshay*).

Some of the specimens from this locality are remarkably tabulated, as in Bourguignat's figure (Ann. Sci. Nat. 1890, vol. x. pl. iii. fig. 1), and the body-whorl is even more strongly keeled at the periphery. The eight so-called species of *Neothauma* figured by Bourguignat must be regarded as varieties of this variable form.

The nomenclature of this genus has been fully discussed of late by Mr. Dall[1], but his conclusions, to my mind, are open to objection. In the first place, I would point out that *Martini* was not a binomial author, excepting in occasional or chance instances, and therefore that such chance names as he may have given cannot be accepted.

[1] Trans. Wagner Free Inst. Sci. Philad. 1892, vol. iii. pt. 2, pp. 332–335.

Mr. Dall observes, "If it were not for Martini's name it is very likely that the name *Bulimus*, Scopoli, would have to be adopted for this genus." This appears to me an entirely wrong conclusion, for Scopoli at the reference cited (Introd. Hist. Nat. p. 392) neither described nor referred to any species of the genus in question, and the figure in Swammerdam's work (Bib. Nat. tab. ix. fig. 4) does not represent *Vivipara fasciata* as stated by Dall (he cannot have seen the work), but is a fairly characteristic representation of a *Limnæa*, apparently *L. stagnalis*.

I do not for a moment believe that Scopoli intended that *Bulimus* was to be regarded either as distinct from or an emendation of Adanson's *Bulinus*. I regard it as merely an oversight in the spelling, or a printer's error. If he considered it distinct, surely he would not have put Adanson's name after it; moreover he clearly tells us (Delic. Flor. et Faun. Insub. 1786, p. 67) that, following Adanson, he calls certain shells "*Bulimos*." I think the preceding remarks fairly answer Mr. Dall's question as to "how we can avoid retaining Scopoli's name *Bulimus* for the species *Helix tentaculata*, Linné," now classified under Gray's genus *Bythinia*, for, if we take the figure of Swammerdam as his type, *Bulimus* would then replace *Limnæa*, and if we select the first species he quotes (*Helix putris*) it would take the place of *Succinea*.

The objection raised by Mr. Dall against using *Viviparus* on the grounds that there is an impropriety in making the "bearer of living young" a male, is of little importance. Perhaps it would have been fortunate had Montfort used the feminine termination; but as he did not, I, for one, prefer to let the genus remain *Viviparus* as originally published.

14. Viviparus mweruensis. (Plate LIX. figs. 5, 6.)

Testa umbilicata, conica, in medio carinata, tenuis, subpellucida, pallida, epidermide fugaci tenui olivacea induta; anfractus 6, *subceleriter accrescentes, oblique tabulati, superne obtuse angulati, striis spiralibus plus minus punctatis tenuissimis confertis, lineis incrementi obliquis decussatis sculpti, ultimus ad peripheriam conspicue et subacute carinatus, inferne concentrice punctato-striatus; spira conica, turrita, ad apicem acuta; apertura angulatim rotundata, longit. totius ½ haud æquans, antice subacuminata, paulo effusa; peristoma tenue, margine dextro obliquo, ad carinam angulato, late sinuato, columellari arcuato, anguste expanso et reflexo.*

Longit. 37 *millim., diam.* 30; *apertura* 17 *longa*, 16 *lata.*

Var. pagodiformis. (Plate LIX. fig. 7.) *Testa sub epidermide tenui plus minus rosacea, anfractibus planiusculis, inferne ad suturam forte carinatis, pagodiformibus, et apertura in medio labri acute angulata.*

Hab. Lake Mweru (*R. Crawshay*).

This is one of the most interesting shells in the collection, and belongs to that group of the genus *Viviparus* which I at one time considered distinct, and described under the name *Neothauma*.

A subsequent examination of the animal has apparently proved that there is not sufficient reason for separating it. The present species is remarkable for its conical spire, the conspicuous keel around the middle of the body-whorl, and its somewhat wide umbilicus. In shells belonging to the variety, the whorls are almost flat and without the shouldering at the upper part observable in typical examples, and the peripheral keel winds up the spire above the suture, producing a decided pagoda-like appearance. The operculum is thin, concentrically striated as usual, and also exhibits (especially upon the inner glossy surface) some more or less distinct radiating striæ.

15. Viviparus crawshayi. (Plate LIX. fig. 8.)

Testa ovata, conica, rimata, carinata, cornea, epidermide tenui, olivacea, spiraliter et oblique striata, induta, versus apicem rubro purpurea; anfractus 6, *convexiusculi, ultimus ad peripheriam forte carinatus; apertura angulatim rotundata, longit. totius* ½ *haud æquans; peristoma tenue, margine columellari arcuato, anguste reflexo, albo-cæruleo. Operculum normale.*

Longit. 18½ *millim., diam.* 13; *apertura* 9 *longa.*

Hab. Lake Mweru (*R. Crawshay*).

This species resembles *V. unicolor*, Olivier, *V. robertsoni*, Frauenfeld, and a few others, but may be distinguished by its much more pronounced keel and conspicuous spiral striæ.

16. Viviparus capillaceus, Frauenfeld.

Hab. Angoni-Land, south end of Lake Nyasa (*A. Whyte*).

17. Cleopatra johnstoni. (Plate LIX. fig. 9.)

Testa ovato-conica, vix rimata, epidermide olivacea induta, carinata; spira conica, ad apicem erosa; anfractus 7, *plani, inferne ad suturam carinati, lineis incrementi curvatis tenuibus sculpti, ultimus in medio carinatus, infra carinam convexiusculus, interdum carina secunda minus conspicua prope medium cinctus; apertura ovata, superne et infra leviter acuminata, longit. totius* ½ *fere æquans, sordide vel cæruleo-albida; peristoma continuum, margine externo tenui, superne haud profunde sinuato, columellari arcuato leviter incrassato et reflexo. Operculum primo paucispirale, exinde concentricum.*

Longit. 17 *millim., diam.* 10; *apertura* 8 *longa,* 6 *lata.*

Hab. Lake Mweru (*R. Crawshay*).

This is a very interesting species and recalls the general aspect of some of the North-American *Pleuroceridæ*. Two of the three specimens at hand have the second feebler keel upon the body-whorl, and it is situated just below the peripheral carination. The operculum agrees precisely with that of *C. bulimoides* from the Nile. Named in honour of H. H. Johnston, Esq., C.B.

18. Cleopatra mweruensis. (Plate LIX. fig. 10.)

Testa ovato-acuminata, anguste perforata, subtenuis, sordide

flavida, epidermide tenui induta, liris paucis nigris vel saturate rufis ornata; anfractus circiter 7, convexiusculi, superiores liris spiralibus tribus cincti et zona nigra infra suturam picti, ultimus liris quinque æqualibus duobusque basalibus circa rimam instructus, inter liris lineis incrementi conspicuis fortiter sculptus, zona suturali nigra alteraque circa basim ornatus; apertura ovalis, superne et infra paulo acuminata, longit. totius ½ vix æquans; peristoma tenue, marginibus callo tenui junctis, columellari subreflexo.

Longit. 15 *millim.*, *diam.* 8; *apertura* 6½ *longa*, 4 *lata*.

Hab. Lake Mweru (*R. Crawshay*).

This species is of the same character as *Cleopatra emini*, Smith (P. Z. S. 1888, p. 54), from the Albert Nyanza. It is somewhat larger, has less angular whorls, more keels or liræ, and a narrower basal rimation. The longitudinal sculpture or lines of growth are considerably more conspicuous.

19. Melania tuberculata, Müller.

Hab. Angoni-Land (*A. Whyte*).

This species occurs in Tanganyika, Oukéréwé, the Albert Nyanza, and has previously been recorded from Nyasa.

20. Melania nodicincta, Dohrn.

Hab. Angoni-Land (*A. Whyte*).

The single specimen which I assign to this species is, in some respects, intermediate between it and *M. tuberculata*.

21. Melania turritospira, Smith.

Hab. Angoni-Land (*A. Whyte*).

The specimen from this locality is twice as long as those figured in these 'Proceedings' for 1877, pl. lxxv. figs. 14, 15. Those figures represent the surface too nodose. This species belongs to the so-called genus *Micronyassia* of Bourguignat.

22. Melania woodwardi. (Plate LIX. fig. 11.)

Testa brevis, turrita, nigro-fusca, infra suturam pallidior; anfractus circiter 8, *vix convexiusculi, costis obliquis crassis* 11–12 *sulcisque transversis angustis paucis* (*in anfr. superioribus* 2–3, *in ultimo circiter* 10) *ornati, ultimus costis versus medium sensim obsoletis; apertura ovata, supeme acuminata, longit. totius* ⅓ *paulo superans; columella arcuata, alba, incrassata, reflexa.*

Longit. 19 *millim.*, *diam.* 8; *apertura* 6½ *longa*.

Hab. Lake Nyasa.

The single specimen here described was presented to the Museum by Mr. B. B. Woodward, after whom the species has been named. It is quite distinct from any of the other Nyasa forms. It is a short stumpy shell, of a very dark colour, with oblique coarsely nodose ribs, the nodules being produced by the spiral sulci cutting through the costæ.

23. Melania mweruensis. (Plate LIX. fig. 12.)

Testa elongata, acuminata, albida, punctis rufis, in seriebus transversis dispositis, ornata, epidermide tenuissima pallide olivacea induta; spira elongata, acuminata; anfractus circiter 10, *fere plani, inferne ad suturam leviter constricti vel canaliculati, plicis obliquis sulcis spiralibus decussatis instructi, infra suturam crasse marginati vel balteati, ultimus plicis prope medium obsoletis, inferne transversim sulcatus; sutura parum obliqua; apertura acuminato-ovalis, superne angustata, longit. totius* ⅓ *paulo superans; labrum tenue, superne late et subprofunde sinuatum; columella curvata, alba, incrassata.*

Longit. 22 *millim., diam.* 8; *apertura* 7 *longa,* 4⅓ *lata.*

Hab. Lake Mweru (*R. Crawshay*).

This species, although spotted like *M. tuberculata*, is sufficiently distinct from that form. The plicæ are coarser, the whorls flatter, and the lip more sinuated. The spiral sulci are four in number on the upper whorls and about eight on the body-whorl; they cut through the oblique folds, giving them a more or less nodose appearance. The red dots, which are sometimes produced into short transverse lines, fall upon the ridges between the sulci, and never in the grooves themselves. In some specimens the oblique costæ are almost obsolete, especially upon the last and penultimate whorl.

24. Melania imitatrix. (Plate LIX. fig. 13.)

Testa elongata, acuminata, epidermide luteo-olivacea amicta, punctis rufis paucis sparsis picta; anfractus 8–9, *fere planiusculi, costis oblique arcuatis* 16–18, *quadriseriatim granosis, instructi, ultimus infra medium transversim sulcatus; apertura ovata, superne acuminata, longit. totius* ⅓ *adæquans; labrum supra late sinuatum, antice prominens; columella inferne arcuata, incrassata, alba, reflexa.*

Longit. 21 *millim., diam.* 8; *apertura* 7 *longa.*

Hab. Lake Mweru (*R. Crawshay*).

This species is like *M. tuberculata*, but has less coarse whorls, more distinct ribbing and granulation.

25. Melania crawshayi. (Plate LIX. fig. 14.)

Testa angusta, elongata, albida, epidermide pallide olivacea induta; anfractus 9, *infra suturam serie conspicua, obliqua, conferta tuberculorum cincti, infra nodulos constricti, deinde convexiusculi, lirisque tribus, quarum suprema nodosa, spiraliter instructi, ultimus liris circiter* 9 *cinctus; apertura anguste ovata; labrum tenue; columella arcuata, alba, incrassata.*

Longit. 17 *millim., diam.* 5½; *apertura* 5½ *longa,* 3¼ *lata.*

Hab. Lake Mweru (*R. Crawshay*).

The row of tubercles bordering the suture is prominent and very remarkable. Beneath comes a broad constriction, below which are three transverse ridges, of which the uppermost is ornamented

with nodules, but much smaller than the sutural series. It is a remarkable-looking shell, and probably peculiar to the lake.

26. PHYSA NYASANA, Smith.

Hab. Karonga, west shore but towards the northern end of Lake Nyasa (*R. Crawshay*).

The original specimens (described P. Z. S. 1877, p. 717, pl. lxxv. figs. 16, 17) were obtained at the southern part of the lake.

27. PHYSA KARONGENSIS. (Plate LIX. fig. 15.)

Testa ovata, angusta, perforata, pallide fuscescens; anfractus $3\frac{1}{2}$, *celeriter crescentes, convexi, infra suturam plus minus distincte marginati, lineis incrementi sculpti, ultimus oblique descendens; spira brevis, obtusa; apertura angusta, elongata, longit. totius* $\frac{2}{3}$ *paulo superans; columella contorta, reflexa; labrum tenue, intus leviter incrassatum.*

Longit. $7\frac{3}{4}$ *millim., diam.* $5\frac{1}{2}$; *apertura* $5\frac{1}{2}$ *longa,* $2\frac{2}{3}$ *lata.*

Hab. Karonga.

This species is narrower than *P. nyasana*, has the spire more elevated, the last whorl obliquely descending and the aperture consequently shorter. This is the third species now known from Nyasa.

28. PLANORBIS (PLANORBULA) ALEXANDRINA, var.

Hab. Karonga, Lake Nyasa.

This is the first record of the genus from the lake. The single specimen is a link between those from Tanganyika (figured by me P. Z. S. 1881, pl. xxxiv. figs. 30–30 *b*) and the typical form from Egypt. M. Bourguignat (Ann. Sci. Nat. Zool. vol. x. 1890, p. 23) has considered this variety a distinct species under the name of *Planorbula tanganikana*.

29. UNIO NYASSAENSIS, Lea. (Plate LIX. figs. 16, 17.)

Hab. Angoni-Land, south end of lake Nyasa (*A. Whyte*).

This species is very variable in form and sculpture and offers a fine field for the manufacture of so-called species. Lea described three forms of it under as many names, and M. Bourguignat [1] has given a name to a variety which was figured by me in the Society's Proceedings, 1881, pl. xxxiv. fig. 34.

30. UNIO (METAPTERA) JOHNSTONI. (Plate LIX. figs. 18–20.)

Testa compressa, transversa, elongata, antice nasuta, postice acuminata, ad marginem dorsalem sursum acute alata, tenuis, pallida, epidermide dilute virescente postice obscure radiata induta, versus umbones margaritacea, inæquivalvis, valde inæquilateralis, utrinque angustissime hians; valvæ striis incrementi tenuibus sculptæ, supra umbones tenuiter corrugatæ; margo dorsi incurvatus, ventralis late excurvatus, posticus inter alam dorsalem et extremitatem posteriorem valde sinuatus; pagina

[1] Bull. Soc. malacol. France, 1889, vol. vi. p. 38.

interna pulcherrime margaritacea, iridescens, interdum pallide rosacea; dens cardinalis anticus valvæ sinistræ elongatus, leviter corrugatus, v. dextræ duplex, dens posticus unicus v. dextræ elongatus, rectus, tenuis, prominens, v. sinistræ duplex.

Longit. 53 *millim.*, *alt.* 30, *diam.* 9½.

Hab. Lake Mweru (*R. Crawshay*).

The shells here described are probably only small representatives of this species. The species is quite unlike any other known form from Africa. It recalls the *Unio delphinus*, Gruner, from Malacca, on account of the dorsal wing, and agrees with it also exactly in the hinge-dentition and the ligament. In form it even more closely resembles *Hyria elongata*, Swainson, from British Guiana (Exotic Conch. p. 29, pl. xxiv.).

31. Pliodon spekei (Woodward).

Hab. Sumbu, S.E. Tanganyika (*R. Crawshay*).

Only one species of this genus from Lake Tanganyika has come under the writer's observation, although as many as twenty-six *so-called species* are enumerated by Bourguignat[1].

Like many of the "*species*" from the Central African lakes described by that author, they are of little or no value.

32. Mutela (Spatha) nyassaensis, Lea.

Hab. Nyasa (*A. Whyte*).

The specimens in the present collection are considerably larger than Lea's type, being 3¾ inches long, 2¼ high, and 1¼ in diameter. Besides being more oval than *S. rubens*, as pointed out by Lea, this species is more inæquilateral, the beaks being situated much more anteriorly and less prominent. The impression of the visceral-sac attachment near the anterior adductor scar is smaller also.

EXPLANATION OF PLATE LIX.

Fig. 1. *Ennea johnstoni*, p. 633.
2. —— *karongana*, p. 633.
3, 4. *Helix* (*Pella*) *whytei*, p. 634.
5, 6. *Viviparus mweruensis*, p. 636.
7. —— ——, var. *pagodiformis*, p. 636.
8. —— *crawshayi*, p. 637.
9. *Cleopatra johnstoni*, p. 637.
10. —— *mweruensis*, p. 637.
11. *Melania woodwardi*, p. 638.
12. —— *mweruensis*, p. 639.
13. —— *imitatrix*, p. 639.
14. —— *crawshayi*, p. 639.
15. *Physa karongensis*, p. 640.
16, 17. *Unio nyassaensis*, p. 640.
18, 19, 20. —— *johnstoni*, p. 640.

[1] Nouveautés Malacol., I. Unionidæ et Iridinidæ du lac Tanganika, 1886, pp. 66–93; Iconogr. Malacol. Tanganika, 1888, pls. xxxi.–xxxv.

4. Descriptions of two new Species of Shells of the Genus *Ennea*. By Edgar A. Smith.

[Received August 28, 1893.]

Ennea (Ptychotrema) bassamensis. (Woodcut, fig. 1.)

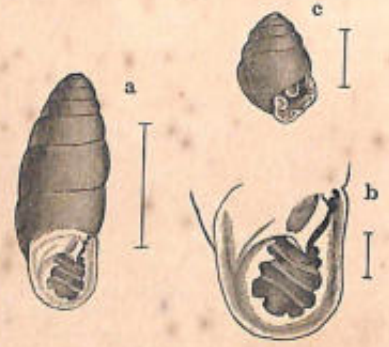
Testa elongata, pupiformis, albida; anfractus 8–9, *convexiusculi, sutura profunda paulo obliqua sejuncti, costulis confertis filiformibus obliquis instructi, ultimus postice ad basin bi-scrobiculatus, prope labrum breviter ascendens; apertura alba, rotunde quadrata, longit. totius* ⅓ *adæquans, plicis et denticulis inæqualibus ringens, plica parietali valida lamelliformi intrante, denticulis tribus columellaribus, unico basali minimo, liris inæqualibus quatuor, lamella unica et denticulo intra labrum munita; peristoma leviter incrassatum, reflexum, album, nitens, marginibus callo tenui junctis.*

Longit. 15 *millim., diam.* 5; *apertura* 4⅔ *longa,* 3½ *lata.*

Hab. Abidjean, Grand Bassam, West Africa.

The first four whorls are rather more convex than the rest, almost smooth, and destitute of the fine oblique liræ which ornament the rest of the shell. The upper edge of these whorls has a narrow pellucid margination and appears crenulated. The dentition of the aperture is best explained by means of a figure (fig. 1*b*).

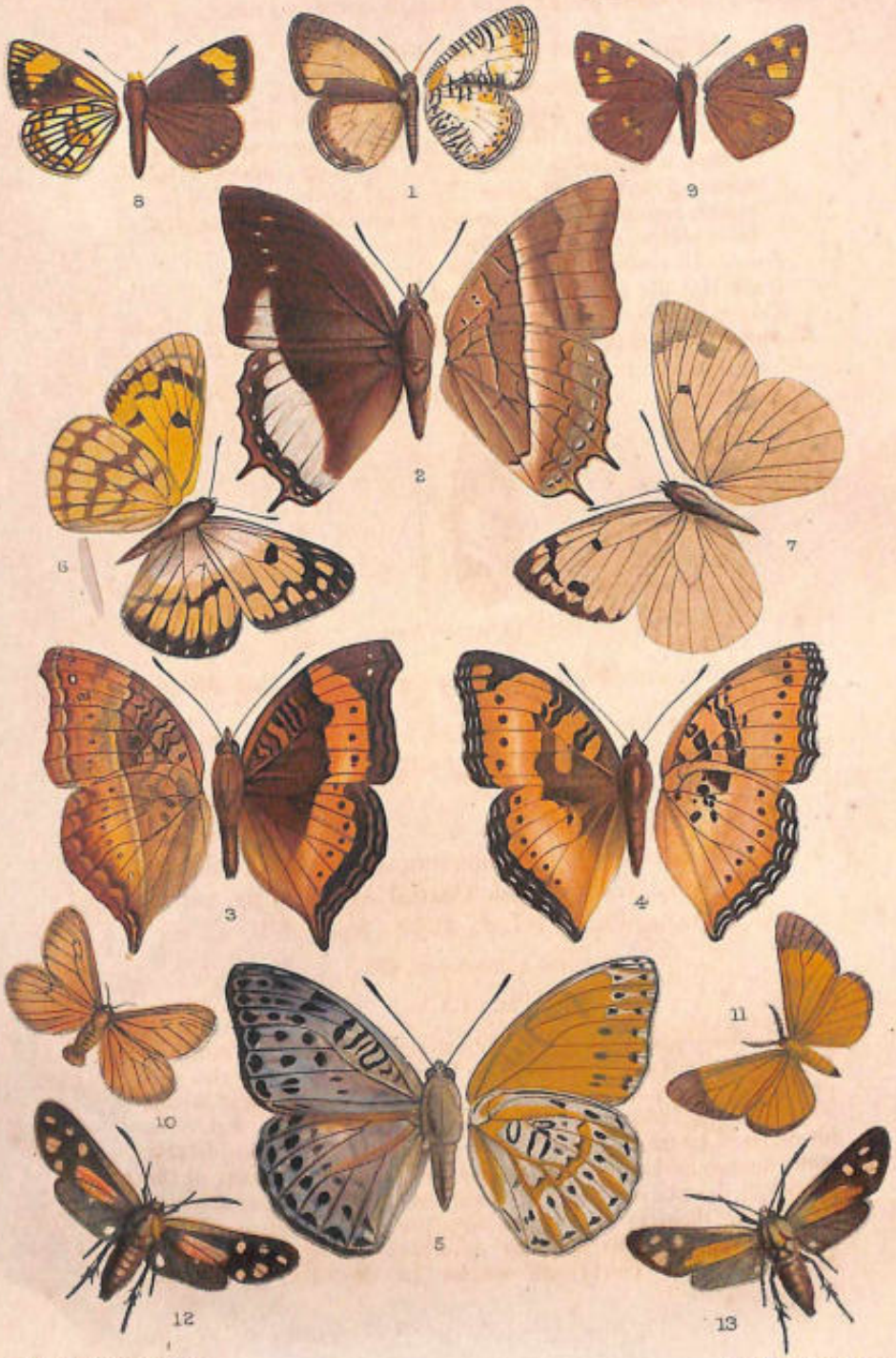
Fig. 1.



Ennea (Ptychotrema) bassamensis.

Ennea cyathostoma, Pfr., from Old Calabar, is closely allied to this species, but differs in its superior size and the dentition of the aperture.

Fig. 1 *c* represents the young state of this species, in which the armature of the aperture is quite different from that of the adult form.



F.W.Frohawk del. et lith.

West, Newman chromo.

New Butterflies from British Central Africa.

ENNEA (EDENTULINA) LONGULA. (Woodcut, fig. 2.)

Testa elongata, pupiformis, rimata, albo-cornea; anfractus 8, *convexiusculi, sutura leviter obliqua et profunda discreti, tenuiter, confertim et oblique lirati, ultimus supra aperturam lævior, haud liratus, antice ad labrum breviter ascendens; apertura inverse subauriformis, longit. totius* $\frac{1}{3}$ *æquans; peristoma leviter incrassatum, anguste reflexum, margine columellari dilatato, reflexo, intus oblique subtorto, dextro arcuato.*

Longit. 16 *millim., diam.* 6; *apertura* 5 *longa,* $3\frac{2}{3}$ *lata.*

Hab. Mayotte (*ex coll. Emile Eudel*).

This species is more elongate than most of the forms of *Edentulina* and bears a general resemblance to *Elma swinhoei* of H. Adams.

Fig. 2.



Ennea (Edentula) longula.

The outer lip, however, is not deeply sinuated as in that section of the genus *Ennea*.

The types of this and the preceding species have been presented to the British Museum by Mr. H. Fulton.

5. On two Collections of Lepidoptera sent by H. H. Johnston, Esq., C.B., from British Central Africa. By ARTHUR G. BUTLER, Ph.D., F.L.S., F.Z.S., &c.

[Received September 20, 1893.]

(Plate LX.)

The collections, of which the following is an account, were made by Mr. R. Crawshay and Mr. A. Whyte respectively; the first principally at Lake Mweru in 1891 and 1892, the second at Zomba between July 1892 and January 1893. Of the two series the former is in by far the better condition, and the latter considerably more numerous both in species and individuals. So many of the species in the two series are identical that I have thought it better to combine them in one paper: together they represent no less than 216 species, the majority of which belong to the South African fauna. Thirty-one species are described as new to science.

RHOPALOCERA.

1. AMAURIS OCHLEA.

Danais ochlea, Boisduval, Voy. de Deleg. ii. p. 589 (1847).

Zomba, Jan. 1893.

2. AMAURIS LOBENGULA.

Nebroda lobengula, E. M. Sharpe, Ann. & Mag. Nat. Hist. ser. 6, vol. vi. p. 346 (1890).

♂. Near to *A. albimaculata* of Natal, considerably larger and with the costal margin of the primaries comparatively longer (even more so than in *A. hanningtonii*); the spot in the cell much larger, the latter and the subquadrate spot at centre of the lower median interspace of a less pure white; the ochreous belt on the secondaries brighter and of fully double the width; submarginal spots nearly as in *A. echeria*. Expanse of wings 90 millim.

Zomba, July 1892.

Our largest male example of *A. albimaculata* measures 72 millim. in expanse.

3. AMAURIS WHYTEI, sp. n.

♂ ♀. Near to *A. echeria*; larger, the primaries with white spots very slightly tinted with ochre and formed as in *A. hanningtonii*; the secondaries with the ochreous belt paler and duller, resembling the under-surface colouring in *A. echeria*, quite half as wide again as in that species, and with a less acutely angled outer edge: from the preceding species it differs in its inferior size, less produced primaries with yellower spots, the narrower, duller, and paler ochreous belt on the secondaries, and consequently broader black outer border. Expanse of wings 85 millim.

Zomba, December 1892.

I had hoped to find that this was the *A. steckeri* of Kheil, the label of which remained a blank in the collection; but, on looking up the description and figure, I find that *A. steckeri* is typical *A. echeria* and has been compared with *A. albimaculata* under the impression that the latter represented Stoll's species. *A. whytei* is nearer to *A. jacksoni*, E. M. Sharpe, but perfectly distinct.

4. LIMNAS CHRYSIPPUS.

Papilio chrysippus, Linnæus, Mus. Lud. Ulr. p. 263 (1764).

♂ ♀, Zomba, July 1892; ♀, Lake Mweru.

4*a*. LIMNAS KLUGII.

Limnas klugii, Butler, P. Z. S. 1885, p. 758, n. 2.

♀, Rhodesia, Lake Mweru, June 11, 1892.

4*b*. LIMNAS DORIPPUS.

Euploea dorippus, Klug, Symb. Phys. pl. 48. figs. 1–4.

♀, Lake Mweru.

I did not find *L. alcippus* in the collection; but as *Hypolimnas*

alcippoides was in the Zomba series, it is only reasonable to suppose that *L. alcippus* also occurs there.

5. Melanitis solandra.

Papilio solandra, Fabricius, Syst. Ent. p. 500, n. 244 (1775).

Zomba, December 1892 and January 1893.

This is one of the forms of *M. leda* which is not found in India. As already stated, I think the Indian type is, to all intents and purposes, a species distinct from the rufescent form named by Linnæus: when two variable and allied species exhibit similarity *without identity* in one of their many sports, they must still be considered distinct.

6. Melanitis libya.

Melanitis libya, Distant, Ann. & Mag. Nat. Hist. ser. 5, vol. x. p. 405 (1882).

♀, Zomba, January 1893.

The colouring of the under surface evidently differs from that of the type; but, in a genus in which both the colouring and pattern of that surface vary indefinitely, this is unimportant.

7. Gnophodes diversa.

Gnophodes diversa, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. v. p. 333 (1880).

Zomba, July 1892.

8. Mycalesis (Monotrichtis) rhacotis.

Mycalesis rhacotis, Hewitson, Ex. Butt. iii., *Myc.* pl. 8. fig. 50 (1866).

Lake Mweru; Zomba, July 1892, January 1893.

9. Mycalesis (Monotrichtis) eusirus.

Mycalesis eusirus, Hopffer, Ber. Verh. Ak. Berl. 1855, p. 641, n. 13.

Lake Mweru; Zomba, July 1892, January 1893.

I think it doubtful whether this is more than a form of the preceding species, which, however, it would of course supersede if not distinct.

10. Mycalesis (Monotrichtis) miriam.

Papilio miriam, Fabricius, Ent. Syst. iii. 1, p. 242, n. 754 (1793).

Zomba, July and December 1892.

This species varies considerably in size and the greater or less regularity of the outer line of the central belt; examples from the West Coast of Africa in the Museum Collection show a more dentate-sinuate character in this line, especially on the primaries, than those in the present series; but in all other details they correspond.

11. Samanta perspicua.

Mycalesis perspicua, Trimen, Trans. Ent. Soc. London, 1873, p. 104, pl. 1. fig. 3.

Zomba, July 1892 and January 1893.

This species varies in depth of colour and in the width of the pale outer border to the central belt on the under surface; some examples incline to grey and others to ochreous on this surface.

Neocœnyra, Butl.

Mr. Trimen (P. Z. S. 1891, p. 62) sinks this genus as a synonym of *Pseudonympha*, Wllgr., stating that all the characters which I have given to distinguish it from *Cœnyra* are such as occur in *Pseudonympha*; he fails to notice that the palpi and antennæ correspond (as stated in my diagnosis) with those of *Cœnyra*. In *Pseudonympha*, on the other hand, the palpi are clothed with much longer hairs, and the antennæ have a flattened spatulate club. As regards the type (*N. duplex*), which Mr. Trimen sinks as a probable synonym of *Ypthima bera*, Hewits., it is not only not nearly allied to the latter, but it has a totally different appearance, all the red markings being entirely unrepresented in Hewitson's species. I quite agree with my friend in disliking imperfectly characterized genera; but when, after careful comparison with all allied genera, I find it necessary to found a new one, it somewhat surprises me to be informed that it is synonymous with one of the very genera mentioned in the original description as differing in structure.

12. Neocœnyra ypthimoides, sp. n.

Allied to *N. bera*, slightly larger and much darker, the deeper coloration being especially noticeable on the under surface: primaries above with the paler patch enclosing the ocellus extended to inner margin and confined throughout its length by a sinuated dusky postmedian line and a blackish feebly undulated submarginal line; a second small ocellus frequently present on the lower median interspace: in the secondaries the submarginal line is almost regular, not zigzag towards apex as in *N. bera*; the ocelli vary in number from five to six, that nearest the costa being either large, small, or absent, that on the lower radial interspace either small or absent, the two on the median interspaces largest, as in *N. bera*, and the two nearest anal angle small and confluent; the pale area enclosing the ocelli is bounded internally by a widely zigzag dusky postmedian line: markings below as above, but sometimes more sharply defined. Expanse of wings 40–48 millim.

Zomba, July and December 1892, January 1893.

This appears to be a common species, of which the collection contained a long series: I have compared eleven of them with Hewitson's four examples of *N. bera* and find the differences absolutely constant.

13. YPTHIMA ITONIA.

Ypthima itonia, Hewitson, Trans. Ent. Soc. ser. 3, vol. ii. p. 287, n. 11, pl. 18. fig. 13 (1865).

Zomba, December 1892 and January 1893.

The white areas below vary a little in intensity and the ocelli in size; but in other respects this species seems to be wonderfully constant.

14. YPTHIMA SIMPLICIA.

Ypthima simplicia, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xviii. p. 481 (1876).

Lake Mweru; Zomba, July and December 1892, January 1893.

15. PERIPLYSIA JOHNSTONI, sp. n. (Plate LX. fig. 1.)

Wings above cream-coloured; the transverse striations of the under surface showing more or less distinctly through the wings: primaries with the swollen part of the subcostal vein ochreous; costal border to subcostal vein, an apical patch continuous with it and extending downwards to first median branch, outer border in the male, and a broad internal border regularly excised near the external angle, blackish; four or five more or less distinct blind black ocelli with orange irides in a straight line across the disk to second or first median branch, three regular parallel submarginal and marginal black stripes: secondaries with the costa and external border in the male broadly blackish, the latter partly enclosing a submarginal series of black spots; the three black stripes or lines as in the primaries, but more or less distinctly interlined with white (as in all the wings of the female); female with the costal area more or less smoky grey; a blackish diffused submarginal band, sometimes with excised external sinuations, enclosing a series of more or less distinct ocelli with dull orange irides. Body above black, below cream-coloured, with black striæ and three lines on outer border as above; a series of orange ocelli with metallic leaden pupils, five on the primaries and seven on the secondaries (the last two confluent); the central area in the male widely devoid of striation, but in the female the clear space is only represented by an ill-defined fusiform transverse patch or band bounding the ocelli internally. Expanse of wings 37–40 millim.

Zomba, January, July, and December 1892.

This pretty little species is evidently not uncommon; it is a link between *P. leda* and *P. panda*, the under surface of the female being very similar to that of the latter species, only with more sharply defined black striations.

16. CHARAXES SATURNUS.

♂. *Charaxes saturnus*, Butler, P. Z. S. 1865, p. 624, n. 5, pl. 36. fig. 1; ♀. Lep. Exot. i. p. 5, pl. 2. fig. 2 (1869).

Sulim bin Najimb, Konde, Jan. 22, 1893 (*R. Crawshay*).

17. CHARAXES JOCASTE.

♂. *Charaxes jocaste*, Butler, P. Z. S. 1865, p. 628, n. 21.

♀. *Charaxes achæmenes*, Felder, Reise der Nov., Lep. iii. p. 446, n. 729, pl. 59. figs. 6, 7 (1867).

Zomba, July 1892.

I do not see why the name *C. jocaste* should be ignored, since thousands of descriptions applicable to half a dozen species coming from the same locality are allowed to stand. My description characterized four species, of two of which the locality was established, one being from India and the other from Senegal; both species were well known under the names *C. fabius*, Fabr., and *C. jocaste*, Boisd., MS. In the absence of any other known African species, *C. jocaste* from Senegal was perfectly recognizable by my description; therefore it seems to me that, as a matter of fact, it was sufficiently characterized and the name *C. jocaste* (as a matter of principle) should supersede that of *C. achæmenes*. The object of a description is not to glorify the author of it, but to render a new species recognizable, and it is on this account that good figures of new species (when named), although unaccompanied by any description whatever, are recognized as claiming priority over subsequent descriptions of the same species. It is immaterial by what name a species is known, provided that the oldest name by which it was recognized is retained.

18. CHARAXES GUDERIANA.

♂. *Nymphalis guderiana*, Dewitz, Nova Acta Akad. Naturf. Halle, 1879, p. 200, pl. 2. fig. 18.

♂, December 1892; ♂ ♀, January 1893; ♂, Mipa Stream, Mofwi, August 3, 1892 (*R. C.*).

The female approaches that sex of *C. kirkii*, being crossed above by a buff band which on the primaries is broken up, above the first median branch, into two series of spots divergent on the costal area; the bluish-white discoidal spot of the male is also represented by a buff spot.

19. CHARAXES ALLADINIS.

♀. *Charaxes alladinis*, Butler, Cist. Ent. i. p. 5, n. 3 (1869); Lep. Exot. i. pl. 10. fig. 2 (1870).

♂. Above very near to *C. hollandii* (the Sierra Leone representative of *C. ethalion*), but in outline of wing even more quadrate than *C. ethalion* itself, the primaries having a much less arched outer margin and the secondaries being shorter. Above blue-black: primaries with the costa, basal fourth, apex, and outer margin bronze green; two subapical obliquely placed unequal greenish-white spots: secondaries with the costal area purplish brown, the abdominal area, including the greater part of the discoidal cell, clothed with brown hair; external area and veins greenish; a shining bronze-green lunulated stripe halfway between the cell and outer margin, only the last four sinuations

or lunules being well defined; a submarginal series of small blue spots edged internally with white; an irregular marginal border, the first three divisions of which are brick-red and the remainder golden-bronze, shading into white on centre of tails; extreme margin steel-black with scarcely perceptible white fringe. Below the usual markings prevail, but the ground-colour has the rufous character of that of the female. Expanse of wings 73 millim.

Ngama's, Kakoma, Aug. 5, 1892 (*R. C.*); Zomba, Jan. 1893.

20. CHARAXES WHYTEI, sp. n. (Plate LX. fig. 2.)

♂. Belongs to the *C. ethalion* group, but is very distinct, more nearly approaching *C. talaguga*, Holland, in pattern than any other species. Above blue-black, with a submarginal slightly sinuous series of seven greenish-grey spots, tapering from inner margin to last subcostal branch near the outer margin: secondaries with costa greyish; an opaline bluish-white belt changing in certain lights to grey or pale green, narrow at costa, gradually widening to third median branch, nearly of uniform width to just below first median branch, and then abruptly narrowed to inner margin; this belt leaves a rather narrow black outer border, enclosing a submarginal series of small white dashes, touched with blue near anal angle, and a marginal grey-greenish irregular stripe, streaked with dull golden buff and brick-red; extreme margin black. Body as usual; under surface having the usual character, somewhat reddish and sericeous, with a straight white transverse central band bounding the outer series of black lines forming the limit of the almost central belt, and which in this species are united into one almost unbroken line; the ordinary discal lunules united into an irregular, internally black-edged band of greenish, shading into clay-reddish. Expanse of wings 61 millim.

Zomba, December 1892 and January 1893.

21. CHARAXES BOHEMANI.

Charaxes bohemani, Felder, Wien. ent. Monatschr. 1859, p. 321, pl. 6. fig. 3.

Ngama's, August 5, 1892 (*R. C.*).

22. CHARAXES PITHODORIS.

Charaxes pithodoris, Hewitson, Exot. Butt. v., *Charaxes*, pl. iv. figs. 18, 19 (1876).

Rhodesia, Lake Mweru, June 12, 1892.

23. CHARAXES CITHÆRON.

Charaxes cithæron, Felder, Wien. ent. Monatschr. iii. p. 308, pl. 8. figs. 2,3 (1859).

♀, Zomba, January 1893.

24. CHARAXES TIRIDATES.

Papilio tiridates, Fabricius, Sp. Ins. ii. p. 11, n. 43.

♂, Lake Mweru.

25. CHARAXES NEANTHES.

Nymphalis neanthes, Hewitson, Exot. Butt., *Nymphalis*, pl. 1. figs. 2, 3 (1854).

♂, Lake Mweru.

26. PALLA VARANES.

Papilio varanes, Cramer, Pap. Exot. ii. pl. clx. D, E (1879).

Lake Mweru; Zomba, January 1893.

27. HYPOLIMNAS MISIPPUS.

Papilio misippus, Linnæus, Mus. Lud. Ulr. p. 264 (1764).

♂, Zomba, January 1893; ♀, July 1892.

27 *a*. HYPOLIMNAS ALCIPPOIDES.

Hypolimnas alcippoides, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. xii. p. 102, n. 2 (1883).

♂ ♀, Zomba, July 1892; ♂, Lake Mweru.

27 *b*. HYPOLIMNAS INARIA.

Papilio inaria, Cramer, Pap. Exot. i. pl. ccxiv. A, B (1782).

♀, Lake Mweru.

The form *H. alcippoides* is generally smaller, and *H. inaria* larger, than the type form.

28. PANOPEA EXPANSA.

Panopea expansa, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. ii. p. 177 (1878).

Lake Mweru.

The type of this species was received from Masasi.

29. JUNONIA ARTAXIA.

Junonia artaxia, Hewitson, Exot. Butt. iii., *Jun.* pl. 1. fig. 6 (1864).

Zomba, July and December 1892, January 1893; Lake Mweru.

30. JUNONIA NACHTIGALII.

Precis nachtigalii, Dewitz, Nova Acta Akad. Naturf. Halle, 1879, p. 194, pl. 1. fig. 16.

Zomba, July 1892.

I can see no sufficient reason for distinguishing *Precis* from *Junonia*; the length of the palpi is a slightly variable character and, taken collectively, the difference in length between those of *Precis* as compared with *Junonia* appears to me extremely doubtful: as to the different form of wing, if strictly adhered to, that character would necessitate still further subdivision of the genus.

31. JUNONIA NATALICA.

Precis natalica, Felder, Wien. ent. Monatschr iv. p. 106, n. 65 (1860).

Zomba, July 1892, January 1893.

32. JUNONIA CHAPUNGA.

Junonia chapunga, Hewitson, Exot. Butt. iii., *Jun.* pl. 1. figs. 2, 3 (1864).

Zomba, January 1893.

Varieties also occur (taken in July 1892 and January 1893) which are intermediate in character between *J. chapunga* and *J. pelasgis*, the ocellated spots being united into an ochreous band and continuous with the short oblique band beyond the cell of primaries, which is also ochreous; Hewitson has an example of this variety in his series of *J. chapunga*.

33. JUNONIA CERYNE.

Salamis ceryne, Boisduval, Voy. de Deleg. ii. p. 592 (1847).

♂, Lake Mweru; ♂ ♀, Zomba, January 1893.

34. JUNONIA GALAMI.

Vanessa galami, Boisduval, Faun. Madag. p. 46 (1833).

Zomba, December 1892 and January 1893.

35. JUNONIA AURORINA, sp. n. (Plate LX. fig. 3.)

Allied to *J. sinuata*, Plötz (=*serena*, Weymar), and very similar to both in pattern and in coloration, but the primaries almost of the same form as *J. galami*; the subapical angle is, however, a little more prominent, the outer margin less inarched, and the posterior angle less prominent: the secondaries are of the same form as in *J. sinuata*; below the central area is yellower and the outer borders washed with lilac. Expanse of wings, ♂ 57 millim., ♀ 60 millim.

Zomba, December 1892 and January 1893.

36. JUNONIA TRIMENII, sp. n. (Plate LX. fig. 4.)

Near to *J. micromera*, which it much resembles on the upper surface; it is, however, larger, and has a pinky-whitish diffused band in front of the series of black spots in the male; the central and double black band has two very acute angles, the black spots of the discal series are smaller, and the brown area at base of secondaries is restricted and followed by one or two black spots at the end of the cell; on the under surface all the dark markings on basal area are represented by irregular black spots quite clearly defined. Expanse of wings, ♂ 52 millim., ♀ 56 millim.

Zomba, July and December 1892, January 1893.

This appears to be a much commoner species than *J. micromera*, and is quite constant in all its characters.

37. JUNONIA MICROMERA.

Junonia micromera, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xviii. p. 482 (1876).

Lake Mweru; Zomba, July and December 1892, January 1893.

38. JUNONIA CALESCENS, sp. n.

Precis octavia, Staudinger, Exot. Schmett. pl. 38. fig. 4.

omba, July 1892.

This species is commonly regarded as a variety of *J. octavia*, but there is not a particle of evidence in support of this opinion; in the present collection it is common and constant enough to justify its separation from Cramer's species. It differs as follows:—It is considerably larger (60–65 millim. in expanse), is of a bright rosy red colour, paler in the centre of the disk; all the black markings are less heavy in character, the bar at end of cell in primaries isolated, whereas in *J. octavia* it forms part of a broader and angular band which crosses the wing, and the marginal lunules on the under surface are bluish, instead of chalk-white. It is a constant local representative of *C. octavia*, which does not occur in the present collection.

39. JUNONIA ELGIVA.

Junonia elgiva, Hewitson, Exot. Butt. iii., *Jun.* pl. 1. fig. 1 (1864).

Lake Mweru; Zomba, December 1892 and January 1893.

40. JUNONIA CUAMA.

Junonia cuama, Hewitson, Exot. Butt. iii., *Jun.* pl. 1. figs. 4, 5 (1864).

Zomba, December 1892.

41. JUNONIA CLOANTHA.

Papilio cloantha, Cramer, Pap. Exot. iv. pl. cccxxxviii. A, B (1782).

Lake Mweru; Zomba, December 1892.

42. JUNONIA ACTIA.

Precis actia, Distant, P. Z. S. 1880, p. 185, pl. 19. fig. 7.

Lake Mweru.

43. JUNONIA SESAMUS.

Precis sesamus, Trimen, South Afr. Butt. i. p. 231, pl. iv. fig. 3 (1887).

Lake Mweru.

44. JUNONIA BOÖPIS.

Junonia boöpis, Trimen, Trans. Ent. Soc. London, 1879, p. 331.

♂ ♀, Rhodesia, Lake Mweru, June 12, 1892.

45. JUNONIA CLELIA.

Papilio clelia, Cramer, Pap. Exot. i. pl. xxi. E, F (1779).

Lake Mweru; Zomba, January 1893.

46. JUNONIA CEBRENE.

Junonia cebrene, Trimen, Trans. Ent. Soc. London, 1870, p. 353.

Lake Mweru; Zomba, December 1892 and January 1893.

47. PYRAMEIS CARDUI.

Papilio cardui, Linnæus, Faun. Suec. p. 276, n. 1054 (1761).

Lake Mweru.

48. PROTOGONIOMORPHA DEFINITA.

♂. *Salamis definita*, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. iv. p. 230 (1879).

♀. Like a white form of *P. nebulosa*, but with the base of the wings above grey. Expanse of wings 76 millim.

Zomba, January 1893.

The male was described from Madagascar: we must therefore conclude either that three wide-ranging allied species exist, or that they represent one widely distributed and very variable species; the latter seems to me the more probable solution of the difficulty. In this case the present species would stand as *P. aglatonice*, Godt. (specimens of which we have received previously from Central Africa), and as var. *definita* ♀; *P. nebulosa* would also have to be ranked as an extreme form of the same species.

49. PROTOGONIOMORPHA ANACARDII.

Papilio anacardii, Linnæus, Mus. Lud. Ulr. p. 236 (1764).

Zomba, July 1892.

50. CYMOTHOE THEOBENE.

Harma theobene, Doubleday, Westwood & Hewitson, Gen. Diurn. Lep. i. pl. 40. fig. 3 (1850).

Lake Mweru.

51. HAMANUMIDA DÆDALUS.

Papilio dædalus, Fabricius, Syst. Ent. p. 482, n. 174 (1775).

Lake Mweru; Zomba, July 1892.

52. NEPTIS AGATHA.

Papilio agatha, Cramer, Pap. Exot. iv. pl. cccxxvii. A, B (1782).

Lake Mweru; Zomba, July 1892.

53. ATELLA COLUMBINA.

Papilio columbina, Cramer, Pap. Exot. iii. pl. ccxxxviii. A, B, iv. pl. cccxxxvii. D, E (1782).

Zomba, December 1892 and January 1893.

54. Crenis natalensis.

Crenis natalensis, Boisduval, Voy. de Deleg. ii. p. 592 (1847).

Zomba, January 1893.

The single example is rather darker than the specimens in the Museum series, but differs in no other respect.

55. Crenis crawshayi, sp. n. (Plate LX. fig. 5.)

Greyish blue, the whole centre suffused with rosy lavender; the base and costa of primaries, and the body above, slightly greenish; wings with slightly sinuated black outer margins and delicate white fringes; veins black externally; disk of wings crossed by three series of black spots beyond the middle, the innermost series angulated and very oblique on the primaries, almost obliterated on the secondaries, the first two spots of the series cuneiform, the others rounded; second series double towards costa, the first three spots being preceded by elongate blackish streaks; a minute white dash between the first pair, which would otherwise be lost in the black veins, of which they form a mere thickening; the spot on interno-median area divided; submarginal series formed of more or less lunate spots; costa of secondaries and hairs on abdominal area somewhat brownish. Underside most like that of *C. rosa*, but deeper in colour, the primaries with two complete series of black spots towards outer margin, the first of the inner series and the first two of the outer series enclosed by a pale silvery blue apical costal streak, the three following pairs united by longitudinal streaks of the same colour, the fourth pair by a few blue scales; all the spots of the outer series united to pale blue marginal spots; extreme margin blackish, with white fringe: secondaries having the general aspect of those of *C. rosa*, but entirely different in details; costa broadly pale blue, with a black interrupted longitudinal line above the costal vein; a black spot below it at centre of costa and a cuneiform orange spot enclosing the precostal veinlet; a broad almost triangular blue patch nearly covering the cell, within which are black irregular characters similar to those of *Argynnis* or *Euthalia*; a blue streak runs down the abdominal border, and a second, enclosing the submedian vein, unites with it to form a large anal patch, which encloses a slender black submarginal line and the last two spots of the discal series; from the submedian streak a curved series of triangular blue spots, terminating externally in blackish angular markings, runs across to the cell, with the large patch on which the triangular spots are fused; two series of black spots parallel to the outer margin enclosed in clavate longitudinal pale blue streaks, the outer series submarginal. Body below bluish white. Expanse of wings 65 millim.

Lake Mweru.

A strikingly distinct new species.

56. Eurytela dryope.

Papilio dryope, Cramer, Pap. Exot. i. pl. lxxviii. E, F (1779).

Zomba, January 1893.

57. Hypanis acheloia.

Hypanis acheloia, Wallengren, Lep. Rhop. Caffr. p. 29 (1857).

Rhodesia, Lake Mweru, June 11, 1892; Zomba, July and December 1892.

58. Acræa vinidia.

Acræa vinidia, Hewitson, Ent. Mo. Mag. xi. p. 130 (1874); Exot. Butt. v., *Acræa*, pl. 7. figs. 45, 46 (1875).

Rhodesia, Lake Mweru, June 12, 1892.

59. Acræa cabira.

Acræa cabira, Hopffer, Ber. Verh. Akad. Berlin, 1855, p. 640, n. 7; Peters's Reise nach Mossambique, p. 378, pl. 23. figs. 14, 15 (1862).

Zomba, July 1892, January 1893.

60. Acræa excelsior.

Acræa excelsior, E. M. Sharpe, P. Z. S. 1891, p. 192, pl. xvii. fig. 3.

♀, Zomba, January 1893.

61. Acræa ventura.

Acræa ventura, Hewitson, Ent. Mo. Mag. xiv. p. 51 (1877).

♀. Above quite like a large reddish female of *A. eponina*[1]; primaries below with wider and comparatively paler apical area: the secondaries with three large vermilion spots in the macular central angulated band; the markings of the external border somewhat as in *A. cabira*, but only outlined in black, the zigzag line having much larger marginal triangular spots. Expanse of wings 60 millim.

Zomba, July 1892.

62. Acræa terpsichore.

Papilio terpsichore, Linnæus, Mus. Lud. Ulr. p. 222 (1764).

Papilio eponina ♀, Cramer, Pap. Exot. iii. pl. cclxviii. C, D (1782).

Zomba, July 1892.

My view (Fabr. Cat. p. 133) that *P. terpsichore* was *Acræa*

[1] According to Dr. Holland, who has gone carefully into the synonymy of the *A. serena* group (Ann. & Mag. N. H., October 1893), this is the typical *A. bonasia* of Fabricius, and Cramer's female the same as *A. serena*, Fabr. The only difficulty is that, in the absence of the Fabrician type of *A. serena*, his description is insufficient for the certain identification of the species, the only clue being "Parvus, affinis Terpsichori." In looking up the description of *P. terpsichore*, Linn., I find a reference to a figure by Petiver, which is clearly a bad representation of *Acræa violæ*; the Linnæan description "Apices fusci lunula in medio" corresponds much better with Cramer's female of *A. eponina*, which I believe to be *A. terpsichore*, Linn. Aurivillius, in his important paper on the species described by Linnæus, says: "fortasse ad *Acræa serena*, Fabr., optime referri posset, nisi alæ posticæ saturatiores essent."

horta is rightly opposed by Aurivillius; his hesitation to regard it as *A. serena*, Fabr., = *eponina* ♀, Cramer, seems to be based solely on the words "posticis saturatioribus," and is, I think, hypercritical: the question as to whether *A. serena* is the insect which it is generally supposed to be, in the absence of any mention by Fabricius of the oblique spot on the black at apex, is, I think, far more doubtful. My remark (*loc. cit.*) that the Linnæan description "is applicable to *A. rahira* ♀" appears on more mature reflection to be untenable.

63. Acræa perrupta.

Telchinia perrupta, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. xii. p. 102, n. 4 (1883).

Lake Mweru; Zomba, July 1892.

64. Acræa lycia.

Papilio lycia, Fabricius, Syst. Ent. p. 464, n. 94 (1775).

Lake Mweru.

A. adrasta, Weymar (Stett. ent. Zeit. 1892, p. 85), is the allied *A. cæcilia*.

65. Acræa doubledayi.

Acræa doubledayi, Guérin, Lefebvre's Voy. en Abyss. vi. p. 378 (1847).

Acræa oncæa, Hopffer, Peters's Reise, v. pl. 24. figs. 5–8 (1862).

♀, Lake Mweru; ♂ ♀, Zomba, July 1892.

I believe *A. abadina*, Ribbe, to be this species.

66. Acræa empusa, sp. n. (? local race of *A. asema*, Hewits.)

Allied to *A. doubledayi*, with the aspect of *A. punctatissima*. Sexes nearly alike, semitransparent, tawny; the primaries greyer than the secondaries, with diffused black apical patch; the spots nearly as in *A. doubledayi*, but the primaries with three additional spots in an oblique series below apex; secondaries with marginal tawny spots on the black border. Primaries below with three more or less distinct yellowish-white apical marginal spots on a diffused grey apical nebula; four spots instead of three in the oblique series beyond the cell; no white subapical band in the female, the three additional black spots as above: secondaries with the black spots wider apart, larger and less numerous; rose-colour and spots at base similar, no spot on upper radial interspace, the dot at base of lower radial interspace wanting, and the large spot placed nearer to the base; only one spot on abdominal margin. Expanse of wings, ♂ 46 millim., ♀ 47 millim.

Zomba, July 1892.

One crippled male example has an expanse of 50 millim.

A similar but distinct species is described by Rogenhofer under the name of *A. marnois*.

67. Acræa periphanes.

Acræa periphanes, Oberthür, Études d'Entom. livr. xvii. p. 20, pl. 2. fig. 23 (1893).

One example, Lake Mweru.

Our example is better marked than that of M. Oberthür, all the spots of the under surface of primaries being strongly defined on the upper surface; the secondaries below more distinctly marked with rosy vermilion on abdominal border, where there is one additional black spot. There can be no question whatever that these differences are due to simple individual variation.

In the same livraison M. Oberthür has described a number of species as new upon which Dr. Holland has recently commented in his paper in the 'Annals of Natural History.' I quite agree with him in his statement that all the varieties of *A. proteina* and *A. kilimandjara* are sports of *A. johnstoni*, Godman. I also consider *A. cappadox* to be=*A. bonasia*, *A. strattipoeles* ♂ = *sambavæ*, Ward; *A. conradti*=probably a variety of *A. fornax*, Butl.; *A. serena-melas* a melanism of *A. bonasia*; *A. cæribula*= n. sp. near to *A. caldarena*; *A. masaris* ♀ =*A. monteironis*, Butl. *A. regalis* is allied to, but distinct from, *A. brœsia*, Godm. We have the species represented in the Museum collection.

Of other *Acræas* recently described to which attention should be drawn are *A. albomaculata*, Weymar, Stett. ent. Zeit. 1892, p. 82, which is=*A. ligus*, Druce, and *A. ombria*, Weymar, *l. c.*, which is =*A. caldarena*, Hew.

68. Acræa caldarena.

Acræa caldarena, Hewitson, Ent. Mo. Mag. xiv. p. 52 (1877).

Acræa nelusca, Oberthür, Études, livr. iii. p. 25, pl. 2. figs. 2, 3 (1878).

Acræa amphimalla, Westwood in Oates's 'Matabele-Land,' pl. E. figs. 1, 2 (1881).

Acræa ombria, Weymar, Stett. ent. Zeit. 1892, p. 82.

♂ ♀, Zomba, July 1892; ♂, Lake Mweru.

I cannot agree with Trimen in referring *A. nelusca* to *A. doubledayi*: in the first place the male, although with a slightly smaller black apical patch than usual to the primaries, also lacks the longitudinal grey streaks on the internervular folds, which are very characteristic of *A. doubledayi* ♂; the female, moreover, is quite typical, and, as Trimen says, in it "there is no trace whatever of the subapical whitish bar of *doubledayi* ♀." In the present collection one female corresponds with Oberthür's figure, whilst another is smoky grey, with the central third of the primaries occupied by a broad oblique snow-white belt.

69. Acræa acrita.

Acræa acrita, Hewitson, Exot. Butt. iii., *Acr.* pl. 3. fig. 18 (1865).

♂, Lake Mweru.

70. Acræa guillemei.

♂. *Acræa guillemei*, Oberthür, Études, livr. xvii. p. 19, pl. 1. fig. 1 (1893).

♀. Smoky grey, with black borders and spots as in the male.

Zomba, July 1892 and January 1893.

This species, with its dusky female, is rather strikingly distinct; it does not appear to be rare.

71. Acræa natalica.

Acræa natalica, Boisduval, Voy. de Deleg. p. 590, n. 57 (1847).

♂ ♀, Zomba, July 1892; Lake Mweru.

72. Acræa arcticincta.

Acræa arcticincta, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. xii. p. 103 (1883).

Acræa anemosa, Staudinger, Exot. Schmett. pl. 33. fig. 1.

Zomba, July 1892.

As I pointed out in my description, the black border of the secondaries in this *Acræa* is only half the width of that in *A. anemosa*; the black oblique streak at the end of the cell of primaries is also narrower; it is a well-marked representative form, between which and the species named by Hewitson I have seen no links.

73. Acræa areca.

Acræa areca, Mabille, Bull. Soc. Ent. France, 1888; Nov. Lep. p. 100, pl. xiv. p. 5 (1893).

Acræa khara, Grose Smith, Ann. & Mag. Nat. Hist. ser. 6, vol. iii. p. 128 (1889); Rhop. Exot., *Acr.* pl. 2. figs. 1, 2 (1889).

♂, Zomba, July 1892; ♀, December 1892.

The female has a pale subapical white patch immediately beyond the black oblique bar after end of cell of primaries.

74. Acræa acara.

Acræa acara, Hewitson, Exot. Butt. iii., *Acr.* pl. 3. figs. 19, 20 (1865).

♀. Var. *Acræa pseudolycia*, Butler, Cist. Ent. i. p. 213 (1874).

♂ ♀, Zomba, July 1892.

A. pseudolycia is a rare albino form of the female.

75. Planema johnstoni.

♂. *Acræa johnstoni*, Godman, P. Z. S. 1885, p. 537.

♀. *Acræa* (*Planema*) *johnstoni*, Butler, P. Z. S. 1888, p. 91.

♀ ♀, Zomba, December 1892 and January 1893.

As already stated, Dr. Holland has given the full synonymy of this species, which is more variable in colouring than any other *Planema*. I have seen examples in various collections corr sponding with most of those figured by M. Oberthür.

76. Alæna nyassa.

Alæna nyassa, Hewitson, Ent. Mo. Mag. xiv. p. 6 (1877).

♀. *Alæna major*, Oberthür, Études, livr. xii. p. 7, pl. 2. fig. 5 (1888).

Zomba, December 1892 and January 1893.

It is a singular thing that, at the time when M. Oberthür described and figured his *A. hauttecœuri* and *A. major* and made the observation,—"Jusqu'à présent on ne connaissait d'autre espèce du genre *Alæna* que l'*Amazoula*, Bdv., de Natal,"—one of these species had already been described eleven years, as *A. nyassa*, and the other five years, as *A. interposita*: one does not wish to be severe, but it looks almost as though this author had not gone over his 'Zoological Records' with any great care.

76 *a*. Alæna nyassa, var. ochracea.

Similar in pattern to the type, but the belt across the centre of the wings buff-coloured in the male and wider than in the typical form; that of the female cream-coloured, wider on costa than in the typical female, and less inarched; wings below suffused with buff. Expanse of wings, ♂ 31–36 millim, ♀ 35–36 millim.

Zomba, December 1892 and January 1893.

It is just possible that this may prove to be distinct from *A. nyassa*, but I am rather inclined to believe it to be a dimorphic form corresponding with the ochreous male of *A. interposita*, figured by M. Oberthür as the male of his *A. hauttecœuri*.

77. Alæna amazoula.

Alæna amazoula, Boisduval, Voy. de Deleg. ii. p. 591 (1849).

Zomba, July 1892.

78. Tingra amenaida.

Pentila amenaida, Hewitson, Exot. Butt. v., *Pent.* & *Lipt.* pl. 2. figs. 4–7 (1873).

Zomba, July 1892.

Var. Base of primaries dusky; secondaries smoky brown, with black spots and borders as usual.

Zomba, July and December 1892.

79. Lachnocnema bibulus.

Hesperia bibulus, Fabricius, Ent. Syst. iii. 1, p. 307, n. 163 (1793).

Zomba, July and December 1892.

This species varies considerably in size.

80. Hyreus lingeus.

Papilio lingeus, Cramer, Pap. Exot. iv. pl. cccl xxix. F, G (1782).

Zomba, July 1892.

81. ZIZERA GAIKA.

Lycæna gaika, Trimen, Trans. Ent. Soc. ser. 3, vol. i. p. 403 (1862).

Zomba, July 1892.

82. LYCÆNESTHES BUBASTUS.

Papilio bubastus, Cramer, Pap. Exot. iv. pl. cccl xii. G, H (1782).

Zomba, July 1892.

83. LYCÆNESTHES ADHERBAL?

♀. *Lycæna adherbal*, Mabille, Bull. Soc. Zool. France 1877, p. 217.

Zomba, July and December 1892.

This species is nearest to *L. princeps*, Butl.; the description is imperfect, having been made from a damaged female example; there can therefore be no absolute certainty in its identification excepting by a comparison with the type. The male of the species before me is less brilliantly coloured than the female: shining lavender blue above; the apical area and outer border of primaries dark brown, as also the costal area and sometimes a marginal border on the secondaries; the orange-zoned ocelli are slightly smaller than in the female.

84. CATOCHRYSOPS OSIRIS.

Lycæna osiris, Hopffer, Ber. Verh. Ak. Berlin, 1885, p. 642, n. 21; Peters's Reise nach Mossamb. v. p. 409, pl. 26. figs. 11, 12 (1862).

Zomba, July 1892 and January 1893.

85. CATOCHRYSOPS ASOPUS.

Lycæna asopus, Hopffer, Ber. Verh. Ak. Berlin, 1855, p. 642, n. 22; Peters's Reise nach Mossamb. v. p. 410, pl. 26. figs. 13–15 (1862).

Zomba, July 1892.

86. CASTALIUS HYPOLEUCUS, sp. n.

♂. Pale smoky grey, with darker veins and undulated submarginal line: primaries with transverse narrow dusky discocellular bar; an arched or angulated discal series of spots showing through the wing; a blackish marginal line: secondaries with discoidal and discal spots visible through the wing; a marginal series of ocelloid spots, bounded internally by the undulated line; the last but one distinct, blackish, crossed by a few bluish scales; the last or subanal ocellus double, sometimes blackish, but not invariably; all the others indistinct; margin black, preceded near anal angle by a slender white line; body blackish. Under surface chalky or creamy white, with greyish veins; a slender marginal black line, fringe brown, tipped with white: primaries with a short black bar on the discocellulars, an arched or angulated series of five brown or black spots across the disk from fourth subcostal to first

median branch; a submarginal series of almost confluent olive-brown dashes; secondaries with three rounded black equidistant spots across the basal area, a black discocellular bar and a double arched series of eight black spots across the disk; a submarginal undulated line, the first four divisions of which are olive-brown and the remainder saffron-yellow; beyond this line is a series of more or less defined pale yellow spots, succeeded near anal angle by a single black spot crossed by a metallic blue crescent, a double black spot sprinkled with metallic blue scales, and a black dot in the angle itself; body below white. Expanse of wings 40–43 millim.

♀. Larger than the male, the basal area sometimes to beyond the middle suffused with lilac; a large black spot at the end of the discoidal cell of primaries; primaries below with an additional black discal spot; in other respects like the male excepting that the female from Zomba has the discocellular bar and the spots at centre of discal series on the secondaries well-defined in black on the upper surface. Expanse of wings 47–54 millim.

♂ ♂, Forests of Tiveta and Wasin in coll. B.M. ♀ ♀, Victoria Nyanza and Zomba; the former in the Museum, the latter in the present series.

I have long hesitated to describe this very distinct species on account of the more or less damaged condition of all the specimens, and I had hoped Mr. Grose Smith would long since have relieved me from the necessity of doing so, but this I cannot discover that he has done. The species appears to me to come nearest to *C. azureus* from Madagascar, of which it is possible that *C. leucon*, Mab., may be the female, in spite of the extraordinary difference of pattern on the under surface of the primaries.

87. AZANUS NATALENSIS.

Lycæna natalensis, Trimen, South Afr. Butt. ii. p. 77, n. 158 (1887).

Zomba, July 1892.

88. TARUCUS PULCHER.

Lycæna pulchra, Murray, Trans. Ent. Soc. 1874, p. 524, pl. 10. figs. 7, 8.

Zomba, July and December 1892, January 1893.

89. TATURA PHILIPPUS.

Hesperia philippus, Fabricius, Ent. Syst. iii. 1, p. 283, n. 87 (1793).

♀, Zomba, January 1893.

90. TATURA CÆCULUS.

Iolaus cæculus, Hopffer, Ber. Verh. Ak. Berlin, 1855, p. 642, n. 17; Peters's Reise nach Mossamb. v. p. 402, pl. 25. figs. 12–14 (1862).

♀, Zomba, January 1893.

91. VIRACHOLA ANTA.

Lycæna anta, Trimen, Trans. Ent. Soc. ser. 3, vol. i. p. 402 (1862).

♂, Zomba, December 1892 and January 1893.

92. SPINDASIS NYASSÆ.

Aphnæus nyassæ, Butler, Ent. Mo. Mag. xx. p. 250 (1884).

♀, Zomba, December 1892.

A much damaged example, but corresponding exactly in under-surface pattern with the male.

93. SPINDASIS HOMEYERI.

Aphnæus homeyeri, Dewitz, Deutsche ent. Zeitschr. xxx. p. 429, pl. 2. figs. 5 *a–c* (1886).

Zomba, December 1892.

In the plate the coloration of the upper surface is a little too florid; in fact, the upper surface is not unlike that of *Spindasis natalensis*; the pattern of the under surface at once fixes the species.

94. AXIOCERSES AMANGA.

Zeritis amanga, Westwood in Oates's 'Matabele-Land,' p. 351, n. 62 (1881).

Lake Mweru; Zomba, July 1892.

95. AXIOCERSES HARPAX.

Papilio harpax, Fabricius, Syst. Ent. App. p. 829, n. 327–8 (1775).

Lake Mweru; Zomba, July 1892 and January 1893.

96. AXIOCERSES PERION.

Papilia perion, Cramer, Pap. Exot. iv. pl. cclxxix. B, C (1782).

Zomba, July and December 1892.

It appears to me that Hübner has as much claim to the genus *Axiocerses* as Felder has to the majority of the genera indicated by him in the 'Reise der Novara.'

97. MYLOTHRIS AGATHINA.

Papilio agathina, Cramer, Pap. Exot. iii. pl. ccxxxvii. D, E (1782).

♂ ♀, Lake Mweru; ♀, Zomba, December 1892 and January 1893.

As I have explained elsewhere, the genus *Mylothris* is readily separable from *Belenois*, not only by its slightly longer wings, but as having only four branches to the subcostal vein of primaries. When describing *Belenois welwitschii*, Herr Rogenhofer recognizes the fact, mentioning "die gegabelte Apicalader" as a distinguishing character of the genus *Belenois*; nevertheless, in the same paper (Ann. Nat. Hofmuseums, Wien, 1889, pl. xxiii.), he has figured *Belenois ianthe* under the new name of *Mylothris agylla*, Rgh., and *Phrissura phaola* as also a *Mylothris*. His *B. welwitschii* comes

near to *B. calypso* and might almost be a hybrid between that species and *B. sabrata=thysa*, var.; the description is based upon two examples, both of them males.

98. Mylothris rüppelli.

Pieris rüppellii, Koch, Indo-Austr. Lep. Fauna, p. 88 (1865).

♀, Zomba, January 1893.

99. Nychitona alcesta.

Papilio alcesta, Cramer, Pap. Exot. iv. pl. cccIxxix. A (1782).

Lake Mweru.

100. Colias edusa.

Papilio edusa, Fabricius, Mant. Ins. ii. p. 23, n. 240 (1787).

♀, Zomba, December 1892.

101. Terias zoe.

Terias zoe, Hopffer, Ber. Verh. Ak. Berlin, 1855, p. 640, n. 5; Peters's Reise nach Mossamb. v. p. 369, pl. 23. figs. 10, 11 (1862).

♀, Zomba, January 1893.

102. Terias regularis.

Terias regularis, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xviii. p. 486 (1876).

♂ ♀, Zomba, July and December 1892.

103. Terias orientis.

Terias orientis, Butler, P. Z. S. 1888, p. 71, n. 87.

Terias butleri, Trimen, Afr. Butt. iii. p. 23, n. 244 (1889).

♂, Lake Mweru; ♀, Zomba, July 1892.

I had suspected the identity of *T. orientis* and *T. butleri* ever since reading the description of the latter, and in 1891 Mr. C. Barker kindly gave us a typical example of *T. butleri* from Palapye, Kama's country, Mashonaland, enabling me to prove the fact beyond question.

104. Teracolus rhodesinus, sp. n. (Plate LX. fig. 6.)

♂. Intermediate in character between *T. vesta* and *T. catochrysops*. Upper surface creamy buff, with white basal third and blue-grey basal scaling: primaries with slender black costal margin; discocellular spot large and black as in *T. mutans*; the external border nearly as in *T. doubledayi*, only the veins are not black beyond the bisinuated inner band of the black-brown external area: secondaries with the inner band or edging of the external area very narrow and almost obliterated below the third median branch, the outer border also narrow as in *T. doubledayi*, but more sharply defined; the enclosed spots consequently are longer than usual. Below like *T. vesta*, but the primaries with the bisinuated 3-band narrower and the secondaries of a more lively sulphur-yellow tint,

with saffron-yellow veins on basal area. Expanse of wings 45 millim.

Rhodesia, Lake Mweru, October 17, 1892.

105. TERACOLUS PHLEGYAS.

Anthocharis phlegyas, Butler, P. Z. S. 1865, p. 431, pl. 25. figs. 3, 3*a* (1865).

♂, Salim bin Najimb, Konde, January 18, 1893 (*R. C.*).

106. TERACOLUS ANAX.

Callosune anax, H. Grose Smith, Ann. & Mag. Nat. Hist. ser. 6, vol. iii. p. 125 (1889); Rhop. Exot. i., *Call.* pl. 1. figs. 5–8 (1889).

♀, Lake Mweru.

107. TERACOLUS THEOGONE.

Anthocharis theogone, Boisduval, Sp. Gén. Lép. i. p. 575, n. 23 (1836).

♂ ♀, Lake Mweru.

108. TERACOLUS SUBVENOSUS.

Teracolus subvenosus, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. xii. p. 105, n. 10 (1883).

♂, Zomba, July 1892.

109. TERACOLUS OMPHALE.

Pieris omphale, Godart, Enc. Méth. ix. p. 122, n. 12 (1819).

♂, Lake Mweru.

110. CATOPSILIA FLORELLA.

Papilio florella, Fabricius, Syst. Ent. p. 479, n. 159 (1775).

♀, Zomba, July 1892.

111. CATOPSILIA PYRENE.

Colias pyrene, Swainson, Zool. Ill. i. pl. 51 (1820–21).

♂ ♀, Zomba, July and December 1892.

112. BELENOIS SEVERINA.

Papilio severina, Cramer, Pap. Exot. iv. pl. cccxxxviii. G, H (1782).

♀, Rhodesia, Lake Mweru, June 13, 1892.

113. BELENOIS AGRIPPINA.

Pieris agrippina, Felder, Reise der Nov., Lep. ii. p. 173, n. 159 (1865).

♂, Lake Mweru; ♀, Zomba, July 1892.

Personally I have no doubt that Felder's *Pieris agrippina* is the large African representative of *B. mesentina*, with blackish-brown veins on under surface of secondaries. My friend Trimen's attempt to convince us that it is a varietal form of *B. severina* seems to me to be a work of supererogation: we have an abundant

African species, which agrees with Felder's description closely enough (I should have imagined) to satisfy anyone; but, probably because the base of the front wings on the under surface is said to be tinted with sulphur (a character only faintly indicated at the base of the costal border in the males), it is regarded as a variety of *B. severina*. Felder, comparing his *Pieris agrippina* with the latter species, rightly observes that it has the costal margins of the wings longer and the cells longer and narrower; he also notes that the white spots on the black apical area of the primaries are tolerably large, the inner edge of the outer border of the secondaries squamose, and the veins on the under surface of the same wings violaceous brownish, none of which characters are found in typical *B. severina*, nor have I ever met with a variety of that species possessing them. *B. lordaca* is, as Trimen observes, doubtless the same species as *B. mesentina*; but as to *B. auriginea* being the spring brood, Col. Yerbury's collection rather tended to show that it prevailed in the autumn, if I remember rightly.

114. Belenois gidica.

Pieris gidica, Godart, Enc. Méth. ix. p. 131, n. 37 (1819).

♀, Lake Mweru.

115. Belenois crawshayi, sp. n.

♂. Allied to *B. zochalia*. Above greenish white: primaries with silvery sericeous base; costal margin slenderly edged with black; the external border formed as in *B. calypso*, but rather more decided and without the apical white streak between the first and second spots; the five spots which remain quite white, the first, third, and fifth small and sagittate, the second larger and pyriform, the fourth minute and squamose; a very conspicuous black spot on the lower discocellular veinlet: secondaries with well-defined marginal black spots. Primaries below with the apical area pale sulphur-yellow, crossed by olive-brown veins and edged internally from costa to lower radial vein by an irregular narrow band of the same colour, below this by a grey lunule which connects it with a triangular black spot on second median interspace; black discocellular spot as above: secondaries creamy sulphur, with basal third of costal margin and a short interno-median basal streak of saffron- or cadmium-yellow; the veins, a forked marking in the cell, an oblique bar on the lower discocellulars, two or three squamose streaks across the base of the interno-median and first median areas, a partly disconnected zigzag submarginal stripe, and a series of broadly triangular marginal spots pale olive-brown; fringe white, spotted with grey and tipped with black at the extremities of the median branches: body below creamy whitish, the palpi pure white. Expanse of wings 63 millim.

Lake Mweru.

We have two males of this species in the Museum from Lake Tanganyika.

116. BELENOIS DIMINUTA, sp. n. (Plate LX. fig. 7.)

♀. Allied to the preceding species; considerably smaller; the white spots on apical area enlarged, almost confluent, so as to divide it into an inner irregular oblique black band; a quadrate black spot on second median interspace and a dentated grey-brown external border, widest at apex; the black discocellular spot rather smaller than in *B. crawshayi* and the silvery basal area of wider extent: secondaries immaculate, the fringe slightly brownish: apical area below testaceous, the oblique band and quadrate spot of the upper surface represented in brownish grey, but the outer border obliterated: secondaries dull creamy stramineous, whiter on the veins; a faintly indicated testaceous spot on the lower discocellular and two or three very indistinct testaceous Λ-shaped markings representing the submarginal line of the preceding species. Expanse of wings 50 millim.

Lake Mweru.

I should have preferred to regard *B. diminuta* as the female of *B. crawshayi*, but females in this genus are usually as large as or larger than males and always have better defined markings; that there should be a solitary exception to this rule seems in the highest degree improbable.

117. HERPÆNIA ERIPHIA.

Pieris eriphia, Godart, Enc. Méth. ix. p. 157, n. 134 (1819).

Rhodesia, Lake Mweru, June 12, 1892.

118. GLUTOPHRISSA SABA.

Papilio saba, Fabricius, Spec. Ins. ii. p. 46, n. 199 (1781).

♂ ♀, Lake Mweru.

119. NEPHERONIA THALASSINA.

Pieris thalassina, Boisduval, Sp. Gén. i. p. 443, n. 8 (1836).

♂, Lake Mweru.

120. ERONIA LEDA.

Eronia leda, Doubleday, Gen. Diurn. Lep. i. p. 65 (1847).

♂, Lake Mweru.

121. ERONIA CLEODORA.

Eronia cleodora, Hübner, Samml. exot. Schmett. ii. pl. 130 (1816–36).

Lake Mweru.

Herr Weymar (Stett. ent. Zeit. 1892) has redescribed my *E. dilatata* under the name of *E. cleodora*, var. *marginata*.

122. PAPILIO LURLINUS.

Papilio lurlinus, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. xii. p. 106, n. 12 (1883).

Mipa stream, Mofwi, August 3, 1892 (*R. C.*).

The type of this species was received from the Victoria Nyanza.

123. Papilio leonidas.

Papilio leonidas, Fabricius, Ent. Syst. iii. 1, p. 35, n. 103 (1793).
Zomba, December 1892.

124. Papilio corinneus.

Papilio corinneus, Bertoloni, Mem. Acc. Bologna, 1849, p. 9, pl. 1. figs. 1–3.
Zomba, July 1892.

125. Papilio nivinox, sp. n.

Black-brown, with semitransparent snow-white markings above; general character of markings similar to those of *P. corinneus*, excepting that the large spot near the end of the cell and the small one beyond it are so much enlarged that an oblique black line alone divides them, that the oval spot above the third median branch is lengthened and widened so as to form an oblique belt with the above-mentioned discoidal spots, from which it is only separated by the black median vein; that the large patch in the lower (first) median interspace is represented by a large or small oval patch occupying the centre af the interspace; the two subapical spots are rounded and well separated, and, as already mentioned, all the white markings are snow-white, whereas in *P. corinneus* they are greenish white: on the under surface the crimson in the cell is deeper and only occupies the basal half, the outer half of the cell being jet-black; the apical area is deep rufous-brown; the abdominal area of the secondaries is deep crimson to the first median branch; the ochreous spot is obliquely truncated internally; the external area extends inwards so as to fill the second median interspace, and within the cell it extends upwards along the base of the second subcostal branch; instead of being ochreous with a reddish clay-coloured band from the ochreous anal spot, it is reddish clay-coloured with a black band; as above also the markings are snow-white instead of greenish. Expanse of wings 85 millim.

Two examples, Lake Mweru.

This is a far more beautiful species than *P. corinneus*, the contrasts of colouring on both surfaces being much more defined and tasteful; in point of form it differs in the slightly less inarched outer margin of the primaries and more regularly rounded outer margin of the secondaries.

126. Papilio demoleus.

Papilio demoleus, Linnæus, Mus. Lud. Ulr. p. 214 (1764).
Lake Mweru; Zomba, December 1892.

127. Papilio ophidicephalus.

Papilio ophidicephalus, Oberthür, Études, iii. p. 13 (1878).
Lake Mweru.

128. PAPILIO CONSTANTINUS.

Papilio constantinus, Ward, Ent. Mo. Mag. viii. p. 34 (1871); Afr. Lep. p. 1, pl. 1. figs. 1, 2 (1873).

Lake Mweru.

129. PAPILIO MEROPE.

Papilio merope, Cramer, Pap. Exot. ii. pl. cli. A, B (1779).

♂, Rhodesia, Lake Mweru, June 11, 1892.

130. PAPILIO ERINUS.

Papilio erinus, Gray, Cat. Lep. Ins. B. M. i. p. 35, n. 127 (1865).

Lake Mweru; Zomba, December 1892 and January 1893.

The HESPERIIDÆ in the collection are numerous, and so many species have been described of late years, especially by Herr Plötz and Monsieur Mabille, that it has been no light task to work carefully through the accumulation of literature and decide what species are new to science. That the descriptions of Plötz are not easy to follow is a fact, I think, pretty generally admitted, and those who have attempted to recognize his species have not always succeeded in making them evident to their successors. For instance, Herr Ribbe ('Isis,' 1889, p. 261), after quoting the description of *Pamphila ahrendti*, observes:—"It is very difficult, from this short description of Plötz's, to identify *P. ahrendti*. I have therefore had the species figured, by which figure the identification can be gained with certainty." Unhappily, this is far from being a fact, as the figure is a blotchy photolithograph, and might stand for any Hesperiid of the same size; in short, it is utterly useless as an aid to identification. It is a pity that so little work equal to that of Prof. Aurivillius has been produced in Germany, and so little as lucid as that of the late Monsieur Guenée in France. One of the chief difficulties in the identification of Mabille's Hesperiidæ consists in the fact that his new species are frequently placed in the wrong genera.

131. TAGIADES FLESUS.

Hesperia flesus, Fabricius, Spec. Ins. ii. p. 135, n. 621 (1781).

Zomba, December 1892 and January 1893.

132. SARANGESA MOTOZI.

Pterygospidea motozi, Wallengren, Kongl. Svensk. Vet.-Akad. Handl. 1857, p. 53.

Lake Mweru; Zomba, January 1893.

133. SARANGESA MOTOZOIDES?

Sarangesa motozoides, Holland, Ann. & Mag. Nat. Hist. ser. 6, vol. x. p. 288, n. 9 (1892).

Lake Mweru.

134. Sarangesa astrigera, sp. n.

Black-brown, with a faint cupreous gloss; fringes spotted with greyish white; a submarginal series of snow-white dots; indications of a discal series of smaller dots, best defined on the primaries; a minute spot in each discoidal cell; primaries also with two widely separated white points on interno-median area and three small spots in the form of a < beyond the cell: abdomen above black; antennæ black, ringed with white. Wings below more distinctly shot with cupreous than above, in some lights varying to bronzy green; the white dots on primaries nearly as above, but those on secondaries better defined and forming four imperfect series, consisting respectively of two, five, seven, and eight or nine white dots; fringes spotted as above: palpi white below; body greyish. Expanse of wings 33 millim.

Zomba, January 1893.

135. Caprona pillaana.

Caprona pillaana, Wallengren, Kongl. Svensk. Vet.-Akad. Handl. 1857, p. 51; Trimen, South Afr. Butt. pl. xii. figs. 6, 6 *a* (1889).

Zomba, January 1893.

136. Caprona jamesoni.

Antigonus jamesoni, E. M. Sharpe, Ann. & Mag. Nat. Hist. ser. 6, vol. vi. p. 348 (1890).

Pterygospidea jamesoni, Trimen, P. Z. S. 1891, p. 106, pl. ix. fig. 25.

Mipa stream, Mofwi, August 3, 1892 (*R. C.*).

137. Hesperia dromus.

Pyrgus dromus, Plötz, Mitth. naturw. Vereins, 1884, p. 6, n. 13.

Lake Mweru; Zomba, July and December 1892, January 1893.

138. Acleros philander.

Pamphila philander, Hopffer, Monatsber. Kön. Akad. Wiss. Berlin, 1855, p. 643; Peters's Reise nach Mossamb. v. p. 416, pl. 27. figs. 1, 2 (1862).

Zomba, July 1892.

139. Acleros placidus.

Apaustus placidus, Plötz, Stett. ent. Zeit. 1879, p. 360.

Zomba, December 1892 and January 1893.

140. Oxypalpus ruso.

Pamphila ruso, Mabille, Comptes Rendus Soc. ent. Belge, 1891, clxxxiii.

Zomba, December 1892.

The description of the upper surface of primaries seems rather

vague, but I think, from the striking character of the under-surface markings, there can be little doubt that this is Mabille's species; the upper surface appears to be not much unlike the *Pamphila gisyon* of the same author.

141. Osmodes ranoha.

Pamphila ranoha, Westwood in Oates's 'Matabele-Land,' p. 353 (1881).

Zomba, December 1892 and January 1893.

The Hewitson collection contains two specimens unnamed, labelled "Zanzibar" and "Nyassa" respectively.

142. Heteropterus formosus, sp. n. (Plate LX. fig. 8.)

Black-brown, with an angular ochreous subapical band, constricted or divided at third median branch, and a small spot of the same colour near external angle; secondaries with six submarginal ochreous spots, the fringe usually varied with the same colour; the head and thorax more or less clothed with dull ochraceous hairs: primaries below dark cupreous brown, almost black; costal margin sprinkled with pale yellowish scales; a subcostal longitudinal streak, followed below origin of first subcostal branch by a spot; a shorter streak in the cell; a minute transverse spot at end of cell; the angular band and spot of upper surface bright ochreous; internervular folds terminating in a marginal series of more or less triangular pale yellow spots; outer edge of fringe slightly varied with yellow at apex: secondaries milk-whitish, the submedian interspace pale sordid yellow, traversed towards anal angle by a looped blackish line from submedian vein; all the veins black; a large subbasal oblong spot linking the costal and subcostal veins, an irregular central band from second subcostal branch to submedian vein, and a submarginal macular band, consisting of seven divisions, bright ochreous, edged with black: fringe black, almost wholly tipped with ochreous: palpi below black at base, their fringes at first whitish, then reddish ochreous, faintly tipped with black; pectus and legs clothed with ochreous hair; venter black, with ochreous spots at the sides, creamy white in the centre. Expanse of wings 33–36 millim.

Zomba, December 1892 and January 1893.

Evidently this beautiful species is not rare.

143. Cyclopides quadrisignatus, sp. n. (Plate LX. fig. 9.)

Intermediate between *C. metis* and *egipan*; purplish brown; a sinuous transverse spot at end of cell, two obliquely placed trifid subapical spots and a larger bifid spot cut by the second median branch, ochreous; a few very short ochreous bristles below the median vein: secondaries with a few fine ochreous hairs in the cell; a bifid spot at end of cell, a smaller squamous spot below apex and another in first median interspace ochreous: body blackish; antennæ ringed with white, club more or less ochreous.

Wings below cupreous brown; primaries with the ochreous spots larger and brighter than above, that of end of cell deeply incised internally; secondaries immaculate. Expanse of wings 31–35 millim.

Zomba, December 1892 and January 1893.

Two somewhat damaged specimens of this distinct species, which at the first casual examination I mistook for *C. malgacha*, from which, however, they are abundantly distinct.

144. Cyclopides midas, sp. n.

Allied to *C. metis*, chiefly differing above in the much greater size and more golden orange colouring of all the spots; there is, however, a well-defined short orange streak below the costa near the base, a nearly complete belt of subbasal spots crossing the wings obliquely; below all the spots are as well defined as above but rather paler, whereas in *C. metis* the under surface of the secondaries is almost immaculate in the female and quite so in the male. Expanse of wings 30 millim.

Zomba, July 1892.

In the Hewitson collection a specimen from Nyasa is associated with *C. metis*, and in the Museum collection is a second specimen, from Victoria Nyanza.

145. Padraona watsoni, sp. n.

Resembles *Telicota bambusæ* of Moore; decidedly larger and rather brighter in colouring; the oblique black band on the primaries with its outer edge acutely produced at first median branch, as in some other species of *Padraona*, though this band does not run inwards to the base; the inner branch of the furca also carried forwards to costa; the outer border, however, has an irregularly zigzag inner edge; the base is greyish green, with a black spot, ill-defined in the male, near the base of the cell, and the male has basal black streaks on costal and internal borders; the ground-colouring of the female is much yellower than that of the male: the pattern of the under surface, but especially on the secondaries, is very similar to that of *Telicota bambusæ*, but the costal border of the primaries is bright yellow, with the differences in the darker markings mentioned as occurring on the upper surface; the secondaries are bright yellow, with the greyish areas of *T. bambusæ* replaced by greenish; the blackish anal patch well-defined in the male, subquadrate, bounded internally and at anal angle by golden orange; the blackish submarginal spot well-defined and continued to costa; the short greyish central band spotted with blackish, and several smaller spots across the basal area; costa greyish. Expanse of wings 40 millim.

Zomba, ♂ July 1892, ♀ January 1893.

It seems to me that generic distinctions employed for species bearing so close a resemblance to one another as the present insect and *Telicota bambusæ* are somewhat arbitrary and not altogether satisfactory; but the Hesperiidæ are such a difficult

family that any characters which will divide the groups of species are welcome.

146. GEGENES LETTERSTEDTI.

Hesperia letterstedti, Wallengren, Kongl. Svensk. Vet.-Akad. Handl. 1857, p. 49, n. 3.

Zomba, July 1892 and January 1893.

147. BAORIS FATUELLUS.

Pamphila fatuellus, Hopffer, Monatsber. K. Akad. Wiss. Berlin, 1855, p. 643, n. 25; Peters's Reise nach Mossamb. v. p. 417, pl. 27. figs. 3, 4 (1862).

Lake Mweru; Zomba, July and December 1892, January 1893.

148. BAORIS INCONSPICUA.

Hesperia inconspicua, Bertoloni, Mem. Acc. Bol. 1849, p. 15.
Pamphila inconspicua, Hopffer, Peters's Reise nach Mossamb. v. p. 418 (1862).

Zomba, July 1892.

149. BAORIS AMADHU?

Pamphila amadhu, Mabille, Comptes Rendus Soc. ent. Belge, p. lxxviii (1891).

Zomba, December 1892 and January 1893.
I believe I have correctly identified this species.

150. HALPE NIGERRIMA, sp. n.

Black-brown; the primaries with strong bronze reflections; eight hyaline white spots as follows—two small, fusiform, superposed in the cell, a large quadrate spot below them on first median interspace, two small spots on succeeding interspaces placed obliquely, and two still smaller divided by the fifth subcostal branch, a minute spot at centre of interno-median interspace; a streak of yellowish appressed hair-scales on inner margin; fringe tipped with white at external angle: secondaries with a transverse series of four small cream-coloured spots beyond the cell; fringe tipped with white, most widely at anal angle: abdomen tipped with white; head bright golden-green. Under surface dark cupreous brown with bronze-green and purple reflections: primaries with hyaline spots as above, but the small interno-median spot extended forward and forked; an additional white subcostal streak towards the base: secondaries with a white spot, shot with lavender, at centre of interno-median interspace, and adjoining it, beyond the cell, a zigzag series of five lavender spots forming a large W-shaped pattern; fringe as above: body below white, venter barred with black. Expanse of wings 39 millim.

Zomba, January 1893.

Several of M. Mabille's species seem allied to this, but I have been unable to find one of his descriptions which characterizes it. *H. malthina*, Hewits., seems to be also allied.

151. Halpe lugens.

Pamphila lugens, Hopffer, Ber. Verh. Ak. Berlin, 1855, p. 643, n. 26; Peters's Reise nach Mossamb. v. p. 418, pl. 27. figs. 5, 6 (1862).

Zomba, July 1892.

152. Baracus fenestratus, sp. n.

Above almost exactly like *Isoteinon lamprospilus*, but slightly smaller and with the hyaline spots a little smaller; the grey-greenish hairy clothing of the secondaries extending over a much wider area; ground-colouring below like *B. septentrionum*, Wood-Mason, the primaries black with costal and apical areas broadly argillaceous, shading into dust-grey; fringe of the latter colour tipped with white; hyaline spots as above: secondaries golden argillaceous; a longitudinal greyish streak immediately below and bounding the subcostal vein; abdominal area dust-greyish; two small whitish spots on centre of median interspaces; fringe white. Expanse of wings, ♂ 31 millim., ♀ 35 millim.

Zomba, December 1892 and January 1893.

153. Ceratrichia stellata.

Ceratrichia stellata, Mabille, Comptes Rendus Soc. ent. Belge, 1891, p. lxx.

Zomba, December 1892.

154. Aeromachus? johnstoni, sp. n.[1]

♂. Bronze-brown: primaries with two unequal hyaline white dots within the end of the cell and a small subquadrate spot below the lower of them on first median interspace; a dot at basal third of second median interspace, and above it, towards costa, two unequal white dots placed slightly obliquely; base of costa and centre of inner margin slightly dusted with yellowish; posterior two-fifths of fringe tipped with sordid white: secondaries with yellowish hair scales in cell and interno-median interspace; fringe, excepting at apex, sordid white: head, collar, and patagia golden brownish; front of thorax glossed with green; abdomen greyish. Primaries below grey, the apical area and costa lilacine, clouded with blackish; hyaline spots as above; a white diffused streak at base of cell and a small spot across centre of interno-median area: secondaries lilacine-greyish along submedian vein; a dark brown irregular >-shaped band from apex across the disk: fringe of second joint of palpi and anterior femora long and bright yellow; venter greyish white. Expanse of wings 24 millim.

Mipa stream, Mofwi, August 3, 1892.

[1] I have placed this species at the end of the Hesperiidæ because it does not appear to me quite to agree with any of the genera indicated in Lieut. Watson's Revision of the family; from *Aeromachus*, which it most nearly approaches, it differs in the longer terminal joint of the palpi.

P.S.—I find that by some inexplicable oversight the slip of *Rhopalocampta forestan*, Cram. (which was represented in both collections), has dropped out of the MS.

HETEROCERA.

None of these were obtained by Mr. Crawshay, but Mr. Whyte's collection contained a fair series.

155. CEPHONODES HYLAS.

Sphinx hylas, Linnæus, Mant. i. p. 539 (1771).
Zomba, January 1893.

156. AELLOPUS HIRUNDO.

Macroglossa hirundo, Gerstäcker, Arch. Nat. xxxvii. p. 360 (1871).
Zomba, December 1892.

157. CHÆROCAMPA OSIRIS.

Deilephila osiris, Dalman, Analecta Entom. p. 48, n. 21 (1823).
Zomba, July 1892.

158. NEPHELE FUNEBRIS.

Sphinx funebris, Fabricius, Ent. Syst. iii. p. 371, n. 47 (1793).
Zomba, January 1893.

159. ÆGOCERA MENETA.

Noctua meneta, Cramer, Pap. Exot. i. pl. lxx. D (1775).
Zomba, July and December 1892 and January 1893.

160. ÆGOCERA FERVIDA.

Ægocera fervida, Walker, Cat. Lep. Het. i. p. 57, n. 4 (1854); Butler, Ill. Typ. Lep. Het. i. p. 12, pl. 5. fig. 1 (1877).
Zomba, December 1892.
A single worn example, with the outer border of the secondaries of half the usual width and tapering to anal angle.

161. CHARILINA AMABILIS.

Noctua amabilis, Drury, Ill. Ex. Ent. ii. pl. 13. fig. 3 (1773).
Zomba, December 1892 and January 1893.
The outer border of the secondaries slightly narrower than usual.

162. XANTHOSPILOPTERYX SUPERBA.

Eusemia superba, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xv. p. 141, pl. 13. fig. 3 (1875).
Zomba, July 1892.

163. SYNTOMIS CERES.

Syntomis ceres, Oberthür, Études, iii. p. 33, pl. 3. fig. 5 (1878).
Zomba, July 1892.
Evidently a common species: it differs from *S. kuhlweinii* in its larger hyaline spots; this distinction, though apparently unimportant, seems to be quite constant.

164. DIOSPAGE SCINTILLANS, sp. n. (Plate LX. figs. 12, 13.)

Allied to *D. rhebus*, Cramer, and *D. triplax*, Plötz: above black, the primaries brilliantly shot with emerald-green; a broad streak occupying the basal fourth of costa, and three spots beyond it, glittering metallic golden green shaded with golden cupreous: a large oval patch of glittering magenta, varying to purple and edged with fiery copper; five nearly equidistant semihyaline opaline white spots, arranged as follows—one within the end of the cell, one beyond the cell, and three submarginal, the central one of which is largest and crosses the second median branch: secondaries brilliantly shot with prussian blue; a small opaline white spot within extremity of discoidal cell and a larger subanal spot; abdominal border clothed with black hairs: head steel-blue; antennæ black; thorax greenish black, the collar, patagia, and two transverse bands at back of thorax glittering metallic golden green, varying on the patagia to fiery copper; abdomen indigo, imperfectly banded with scattered metallic green scales. Wings below brilliantly shot with prussian blue, which shades into green on apical area of primaries and costa of secondaries; discoidal cell of primaries shaded with purple; costa spotted with metallic pale blue-greenish; all white spots as above: palpi black, legs blue-black; all the tibiæ with a conspicuous white patch; the pectus almost entirely covered with metallic steel-green; abdomen crossed by imperfect bands of the same colour. Expanse of wings 42 millim.

Var. Primaries almost as blue as the secondaries; the three golden-green costal spots, which in the typical form follow the basal streak, wanting; the large metallic patch from median vein to inner margin subquadrate, with a central projecting tooth from its outer margin; in colouring also it differs in being of a fiery copper colour, edged with golden copper; the subapical white spot and the spot near external angle wholly absent; secondaries with the costa purplish, no white spot in the cell, and the subanal spot smaller. Expanse of wings 40 millim.

Zomba, July 1892 and January 1893.

After seeing this magnificent species I am quite satisfied that Cramer's *D. rhebus* is African (not East Indian, as Mr. Kirby has concluded, Syn. Cat. p. 169). Cramer says it was received from Coromandel and the coast of Africa; his first locality, not his second, being unquestionably erroneous.

I should undoubtedly have regarded the variety described above as a distinct species, had there not fortunately been an example intermediate between the two forms in the collection. It is probable, I think, that *D. triplax* of Plötz, which is described as having only three hyaline white spots on the primaries, may also vary in a similar manner; it evidently does not possess the large metallic purplish or cupreous patch, or the smaller metallic golden-green streaks and spots of *D. scintillans*, in which respect the latter is more nearly allied to *D. rhebus*. A fourth species,

probably referable to *Diospage*, is *Glaucopis iridea*, Mabille; but *Sphinx auratus* (Stoll), Cramer, does not belong to the genus.

165. NEUROSYMPLOCA PROCRIOIDES, sp. n.

Primaries smoky grey or semitransparent sooty black; secondaries darker, with bright blue gloss: body black; patagia ochreous; venter ochreous with black anal segment. Expanse of wings 32 millim.

Zomba, January 1893.

166. ANOMŒOTES NIGRIVENOSUS, sp. n. (Plate LX. fig. 10.)

Allied to *A. tenella*, Holland; orange-tawny; semitransparent primaries, with the veins black; the costa, apex, and a narrow decreasing external border diffused grey; neuration distorted; the second and third subcostal branches on a very short footstalk; upper discocellular continued transversely across the upper radial and uniting close below it with the lower radial, which is thrown forward from the third median branch at an oblique angle; the normal lower discocellular thrown backwards as a forked recurrent vein, its lower furca uniting with the median vein just beyond the second branch: secondaries wider than in *A. tenella*, the outer border narrowly grey; in the type the right-hand wing has partly developed an upper radial vein between the second subcostal branch and the ordinary radial: body tawny ochreous; legs brownish. Expanse of wings 31 millim.

Zomba, July 1892.

In low types of Lepidoptera like the *Phaudinæ*, the neuration seems to be very variable; so that characters which in some groups would be of the utmost importance for generic purposes are seen to be utterly unreliable: in all the most important features of its neuration *A. nigrivenosus* agrees with typical *Anomœotes*.

STAPHYLINOCHROUS, gen. nov.

Nearest to *Boradia*: primaries elongate triangular; costal vein throwing off three perpendicular veinlets to the margin before the regular branches; first and second branches emitted from a footstalk before the end of the cell and united by an oblique veinlet to the third above its separation from the fifth; the third, fourth, and fifth emitted from a footstalk which throws off the fifth branch halfway between the cell and the furca formed by the third and fourth branches; anterior part of the cell projecting prominently forwards; lower radial and third median branch emitted together from a short footstalk: secondaries with neuration as in *Anomœotes*, but the anterior part of the cell projecting more prominently forwards: body as in *Boradia*, with similar antennæ. Type *S. whytei*.

167. STAPHYLINOCHROUS WHYTEI, sp. n. (Plate LX. fig. 11.)

Orange-tawny; apical two-sevenths of primaries occupied by a belt of smoky grey, regularly tapering from costa to external angle;

secondaries with a narrow decreasing external border of the same colour from apex to submedian vein; antennæ dark brown; body tawny ferruginous, abdomen tipped with blackish, extremity of tarsi also blackish. Expanse of wings 37 millim.

Zomba, January 1893.

The most Geometriform genus of *Phaudinæ* that I have hitherto seen.

168. LEPISTA TRIMENII.

Dyphlebia trimenii, Felder, Reise der Nov., Lep. iv. pl. cvi. fig. 32.

Zomba, July 1892.

169. DEIOPEIA PULCHELLA.

Tinea pulchella, Linnæus, Syst. Nat. i. p. 534, n. 238 (1758).

Zomba, July 1892.

170. ARGINA LEONINA.

Argina leonina, Walker, Lep. Het. xxxi. p. 262 (1864).

Zomba, July 1892.

171. ARGINA AMANDA.

Euchelia amanda, Boisduval, Deleg. Voy. ii. p. 597, n. 133 (1847).

Zomba, July 1892 and January 1893.

172. RHANIDOPHORA PHEDONIA.

Bombyx phedonia, Cramer, Pap. Exot. iv. pl. cccxlvii. C (1782).

Zomba, December 1892 and January 1893.

173. CANOPUS RUBRIPES.

Amerila rubripes, Walker, Lep. Het. xxxi. p. 304 (1864).

Zomba, July 1892.

174. LACIPA BIZONOIDES, sp. n.

Nearest to *L. gracilis*, but differing from all its allies in the absence of black spots from the primaries; these wings sericeous pure white; a spot at the base and two rather broad parallel straight stripes which divide the wing into three equal parts golden orange; outer half of fringe slightly golden: secondaries and abdomen cream-coloured: head buff-coloured; collar and patagia orange, the latter with white fringes; anus blackish; under surface sordid buff-whitish. Expanse of wings 28 millim.

Zomba, January 1893.

175. ARTAXA OCHRACEATA.

♀. *Aroa ochraceata*, Walker, Lep. Het. xxxii. p. 327 (1865).

Zomba, January 1893.

The male of this species seems to be rare, only females having come to hand.

176. OLAPA FULVINOTATA, sp. n.

♂. Closely allied to *O. adspersa*, Herr.-Sch.; larger, the primaries and body yellower; the spots on the primaries bright orange instead of black and more conspicuous. Expanse of wings 40–47 millim.

♂, Zomba, December 1892 and January 1893.

The genus *Olapa* is nearly allied to *Lælia*, but may readily be distinguished from the fact that the second and third median branches of the secondaries (veins 3 and 4) are widely separated at their origins, whereas in *Lælia* they are emitted close together; on the other hand, the third median and radial in *Olapa* are closer together than in *Lælia*.

177. AROA DISCALIS.

Arga discalis, Walker, Lep. Het. iv. p. 792, n. 1 (1855).

♂, Zomba, January 1893.

178. LEPTOSOMA LEUCONOE.

Nyctemera leuconoe, Hopffer, Monatsber. Akad. Berlin, 1857, p. 422; Peters's Reise nach Mossamb. v. p. 174, pl. 28. fig. 3 (1862).

Zomba, July and December 1892.

179. ANTHEUA SIMPLEX.

Antheua simplex, Walker, Lep. Het. iii. p. 687, n. 1 (1855).

Zomba, July 1892.

180. PHIALA COSTIPUNCTA?

Heteromorpha costipuncta, Herrich-Schäffer, Aus. Schmett. i. fig. 375 (1855).

♀?, Zomba, July 1892.

181. PSEUDAPHELIA APOLLINARIS.

Saturnia apollinaris, Boisduval, Voy. de Deleg. ii. p. 601 (1847).

Zomba, January 1893.

182. BUNÆA EPITHYRENA.

Bunæa epithyrena, Maassen & Werning, Beitr. Schmett. figs. 86, 87 (1886).

Zomba, July 1892.

183. GYNANISA MAIA.

Saturnia maia, Klug, Neue Schmett. pl. 5. fig. 1 (1836).

Zomba, January 1893.

The single example obtained is somewhat aberrant; but the differences from the typical form are not of such a nature that they may not be simply the result of individual variation; I have, therefore, not felt justified in regarding it as a distinct species.

Although the *Noctuæ* are tolerably well represented in the present collection, all the species obtained belong to the "quadrifid" type.

184. Ædia dulcistriga.

Anophia dulcistriga, Walker, Lep. Het. xv. p. 1811 (1858).
Zomba, December 1892.

185. Polydesma umbricola.

Polydesma umbricola, Boisduval, Faune Ent. de Madag. p. 108, n. 1, pl. 13. fig. 5.
Zomba, July 1892.
This species seems to be common throughout Africa.

186. Calliodes rivuligera, sp. n.

Umber-brown, suffused, but especially towards external border, with olivaceous greenish and towards base with slaty greyish; crossed by numerous irregular black stripes, some of which are partly shot with dull blue, but the two following the ocellus on primaries with shining leaden grey; the first four stripes on the primaries irregularly angulated, the fifth falciform, bounding the outer edge of the ocellus, becoming leaden towards costa; sixth stripe arched and undulated; seventh parallel to the sixth, macular; the eighth slender, submarginal, undulated, not reaching the costa; the ninth slender, slightly undulated, marginal; fringe traversed by an indistinct central pale line; ocellus with the ~-shaped part bronze-green shaded with olive-brown, edged with pale brown, bordered below with black, the lobe of the ~ broadly black externally and crossed by three equidistant metallic leaden bars; the tail of the ~ enclosing a perpendicular metallic leaden streak; the V-shaped portion of the ocellus, enclosed by the comma, shining leaden grey, interrupted by longitudinal bars of the ground-colour and bounded on both sides by pure white, more or less triangular spots: secondaries without basal bands; a short bar crossing the cell, followed by two parallel irregularly denticulated angulated bands, then three tolerably regular parallel zigzag stripes, a series of subconfluent diamond-shaped spots, a submarginal zigzag stripe; marginal line and fringe as on primaries: body normal, but darker than in *C. apollina*. Under surface pale brick-red; primaries greyish at external border, which is bounded internally by a blackish zigzag line, interrupted by blackish veins, encloses a series of blackish spots, and is edged externally by a black marginal line; fringe as above; across the disk is a second indistinct interrupted zigzag or lunulated line, interrupted in the middle by two conspicuous superposed black spots; a blackish looped character represents the reniform spot, and on the interno-median interspace there is a blackish longitudinal streak: secondaries with a black discocellular spot; a black lunulated discal stripe, a black dentate-sinuate submarginal line connected with

the black outer margin by black veins, between which is a series of black spots; fringe as above. Expanse of wings 44–53 millim.

Zomba, July 1892 and January 1893.

The minimum measurement is taken from an example in the Museum from Delagoa Bay. The species, if my memory serves, is nearly allied to *C. pretiosissima*, Holland (Ent. Suppl. 1892, p. 94).

187. Calliodes glaucescens, sp. n.

General tint above lavender-greyish; the basal and costal areas of primaries shot with sericeous lavender; the area below and beyond the ocellus bronzy greenish, shaded with yellowish and with golden brown; a belt enclosed by the second to fifth lines pale brownish glossed with pink; outer border greenish grey, fringe grey-brownish; one slender black line, which in certain lights changes to leaden grey and becomes inconspicuous, across basal two-sevenths; all the other lines undulated, beyond the ocellus—the first, which bounds the ocellus externally, sepia-brown, varying to steel-bluish towards costa; second line parallel to the first, glossed throughout with steel-blue; third line abbreviated towards costa, glossed with steel-blue; fourth brown, straight towards inner margin, abbreviated towards costa; the submarginal and marginal lines slender and black; ocellus somewhat similar to that of the preceding species; the ⌣-shaped portion bounded externally by a black stripe edged on both sides with yellowish, the lobe black externally, the inner half of the black patch glossed with metallic leaden and edged with white; leaden marking in the tail of the ⌣ also white-edged; V-shaped area shot with sericeous lavender and edged with white: secondaries rufescent, slaty greyish towards inner margin and greenish on external border, the fringe of abdominal border brick-red; a small black spot at end of cell, followed by a straight black band, immediately beyond which is a blackish stripe; from this point the veins are shot with steel-blue; three regular parallel dentate-sinuate blackish stripes, glossed with steel-blue, excepting on the internervular folds; a brown dentate-sinuate stripe parallel to the others; submarginal and marginal sinuated black lines: head dark brown, with a red line between the antennæ; collar dark brown, red at the sides; body smoky mouse-grey; abdomen rose-red at the sides. Underside of wings bright opaque reddish orange; black spots at end of discoidal cells, followed by two parallel angulated discal series of spots, black and distinct on the secondaries; a third series of indistinct grey dots, followed on the primaries by a series of grey lunules; a submarginal series of spots, very minute on the primaries, and a marginal series of dots, black: body below rose-red; palpi black externally, tibiæ and tarsi black. Expanse of wings 53–57 millim.

Zomba, December 1892 and January 1893.

This lovely species has very much of the general pattern of the allied genus *Spirama*.

188. Cyligramma rudilinea.

Cyligramma rudilinea, Walker, Lep. Het. xiv. p. 1311, n. 5 (1857).

♂, Zomba, July 1892.

189. Cyligramma latona.

Phalæna (Noctua) latona, Cramer, Pap. Exot. i. p. 20, pl. xiii. B (1779).

Zomba, July 1892 and January 1893.

190. Cyligramma limacina.

Cyligramma limacina, Guérin, Icon. Règne Anim., Ins. pl. 89. fig. 2, texte, p. 520.

Zomba, December 1892 and January 1893.

191. Maxula capensis.

Hypopyra capensis, Herrich-Schäffer, Auss. Schmett. figs. 121, 122.

Zomba, ♀ July 1892, ♂ January 1893.

192. Entomogramma pardus.

Entomogramma pardus, Guenée, Noct. iii. p. 205, n. 1606 (1852).

Zomba, January 1893.

193. Entomogramma nigriceps.

Renodes? nigriceps, Walker, Lep. Het. xv. p. 1595, n. 6 (1858).

Zomba, January 1893.

194. Dysgonia algira.

Phalæna-Noctua algira, Gmelin, ed. Syst. Nat. i. 5, p. 2547, n. 98.

Zomba, December 1892 and January 1893.

195. Dysgonia derogans.

Ophiusa derogans, Walker, Lep. Het. xv. p. 1832 (1858).

Zomba, January 1893.

196. Grammodes geometrica.

Phalæna-Noctua geometrica, Rossi, Faun. Etr. ii. p. 179.

Zomba, July and December 1892, January 1893.

197. Trigonodes hyppasia.

Phalæna-Noctua hyppasia, Cramer, Pap. Exot. iii. p. 99, pl. ccl. E (1782).

Zomba, January 1893.

198. Drasteria judicans.

Ophiusa judicans, Walker, Lep. Het. xv. p. 1831 (1858).

Zomba, July 1892 and January 1893.

199. PLECOPTERA, sp. inc.

Allied to *P. resistans*, but the two examples obtained are not in good enough condition to describe, though there is little question as to their representing a species new to science.
Zomba, January 1893.

200. AZAZIA RUBRICANS.

Ophiusa rubricans, Boisduval, Faune Ent. de Madag. p. 106, n. 11, pl. 16. fig. 1.
Zomba, January 1893.

201. REMIGIA MUTUARIA.

Remigia mutuaria, Walker, Lep. Het. xiv. p. 1506, n. 7 (1857).
Zomba, January 1893.
The type was from the Cape of Good Hope.

202. REMIGIA ARCHESIA.

Phalæna-Noctua archesia, Cramer, Pap. Exot. iii. p. 145, pl. cclxxiii.
Zomba, December 1892 and January 1893.

203. REMIGIA REPANDA.

Noctua repanda, Fabricius, Ent. Syst. iii. 2, p. 49, n. 133 (1793).
Zomba, December 1892.

204. LACERA CAPELLA.

Lacera capella, Guenée, Noct. iii. p. 337, n. 1802 (1852).
Zomba, January 1893.

205. OPHIODES CROCEIPENNIS.

Ophisma croceipennis, Walker, Lep. Het. xiv. p. 1377, n. 19 (1857).
Zomba, January 1893.

206. DEVA COMMODA.

Plusiodonta commoda, Walker, Lep. Het., Suppl. iii. p. 844 (1865).
Zomba, January 1893.

207. PLUSIA ERIOSOMA.

Plusia eriosoma, Doubleday in Dieffenbach's 'New Zealand,' i. p. 285.
Zomba, December 1892 and January 1893.
This is one of the most widely distributed of the species of *Plusia*.

208. Hypena abyssinialis.

Hypena abyssinialis, Guenée, Delt. et Pyral. p. 39, n. 44.

Zomba, December 1892.

209. Gonodela brongusaria.

Epione ? brongusaria, Walker, Lep. Het. xx. p. 123, n. 14 (1860).

Zomba, January 1893.

210. Gonodela kilimanjarensis.

Gonodela kilimanjarensis, Holland, Ent. Suppl. 1892, p. 95.

Zomba, July and December 1892, January 1893.

Moeschler's *Semiothisa largificaria* (Abhandl. Senck. nat. Ges. xv. p. 95, fig. 20, 1887) seems nearly allied to this species. One of our examples also nearly resembles *G. maligna* from Japan.

211. Gonodela zombina, sp. n.

Not unlike the preceding species; granite-grey, with black discocellular spots; the inner oblique angulated line of primaries ill-defined; the transverse dark grey mottling better defined; the external area from the second line considerably darker than the remainder of the wing-surface, but this difference is less pronounced in a tapering patch immediately beyond the line and extending upwards from inner margin of both wings and on the external border of the secondaries; the outer line of primaries more oblique than in *G. kilimanjarensis*, and continuous with the inner line of secondaries; the outer line of the latter wings slightly nearer to outer margin: wings below white, coarsely mottled with dark grey, the two transverse lines of the upper surface reproduced, the inner one in grey mottling; external area grey-brown, slightly reddish towards apex of primaries, with white nebula towards the middle, the secondaries also with a squamose apical spot; veins of all wings ochreous; costa of primaries buff: body below cream-coloured, speckled with dark grey; legs slightly yellower. Expanse of wings 40 millim.

Zomba, July and December 1892, January 1893.

Compared with *G. kilimanjarensis*, this species has the costal margin of the primaries longer and the outer margin consequently more oblique; the angle of the secondaries is also slightly more defined.

212. Tephrina johnstoni, sp. n.

Greyish white, mottled with fuliginous grey; discocellular spots black, almost obliterated by the dark transverse lines; the primaries crossed obliquely by four lines, the first three angulated towards costa, the first near the base, the second crossing the end of the cell, slightly diverging from the first, but parallel to the third, which is blackish, undulated, its angle almost filled in by an irregular perpendicular dark grey spur from lower radial to sub-

costal vein; fourth line submarginal, angulated near the inner margin, sinuous and running outwards to apex above the angle; between the third and fourth lines a grey nebulous streak runs perpendicularly to the costa, leaving a triangular patch of white at apex; a slightly lunulated black marginal line; fringe traversed by a fuliginous grey line and spotted at the extremities of the veins: secondaries crossed by three blackish lines, the first sub-angulated, crossing the end of the cell, the second arched and undulated, the third greyer than the others, slightly undulated, running from apex to anal angle, the area enclosed by the second and third lines clouded with grey: head and collar brown, vertex whitish; abdomen sericeous brownish. Wings below purer white, with all the markings more sharply defined, the veins rufous-brown, yellowish towards the base; the costa of primaries testaceous: pectus white; legs mottled with fuliginous grey; vertex brassy yellowish at the sides. Expanse of wings 28 millim.

Zomba, December 1892 and January 1893.

We have an example of this species in the Museum from Natal; it does not appear to be very closely allied to any known species, but in some respects approaches *T. observata*.

213. STEMORRHAGES SERICEA.

Phalæna Pyralis sericea, Drury, Ill. Ex. Ent. ii. p. 9, pl. 6. fig. 1.
Zomba, December 1892.

214. HARITALODES MULTILINEALIS.

Botys multilinealis, Guenée, Delt. et Pyral. p. 337, n. 380.
Zomba, January 1893.

215. LYGROPIA MUSCERDALIS.

Botys muscerdalis, Zeller, Lep. Caffr. p. 43.
Zomba, January 1893.

216. CADORENA SINUATA.

Phalæna sinuata, Fabricius, Ent. Syst. iii. p. 208, n. 295 (1793).
Zomba, January 1893.

The four preceding *Pyrales* are the only representatives in the collection of the so-called Micro-Lepidoptera.

EXPLANATION OF PLATE LX.

Fig. 1. *Periplysia johnstoni*, ♂, p. 647.
2. *Charaxes whytei*, ♂, p. 649.
3. *Junonia aurorina*, ♂, p. 651.
4. *Junonia trimenii*, ♂, p. 651.
5. *Crenis crawshayi*, ♂, p. 654.
6. *Teracolus rhodesinus*, ♂, p. 663.
7. *Belenois diminuta*, ♀, p. 666.
8. *Heteropterus formosus*, ♂, p. 670.
9. *Cyclopides quadrisignatus*, ♂, p. 670.
10. *Anomœotes nigrivenosus*, ♀, p. 676.
11. *Staphylinochrous whytei*, ♂, p. 676.
12, 13. *Diospage scintillans*, ♀ ♀, p. 675.

6. On the Chilian Hymenoptera of the Family *Odyneridæ*.

By Edwyn C. Reed, C.M.Z.S.

[Received July 26, 1893.]

A fairly large number of Hymenoptera of the family Odyneridæ exist in Chile, but I have always found a difficulty in determining them on account of the very careless way in which they have been described by Spinola and De Saussure, in Gay's 'Historia Física y Política de Chile.' Many of the species are described from one sex only, often from single specimens, and several species are described twice over.

As I intend shortly to publish a Synopsis of the group, in the 'Anales de la Universidad de Chile,' I have drawn up the following list of the Chilian species.

Gazella, Spin. in Gay, vi. p. 328.

Spinola placed this genus among the Crabronidæ, probably on account of its abnormal venation, the second and third cubital cell each receiving a recurrent vein.

Gazella eumenoides, Spin.

This species is very local and far from common. Occurs in the central provinces.

Zethus dicomboda.

Epipona dicomboda, Spin. in Gay, vi. p. 250 (1851).

This species is not common. Occurs near Valparaiso and at the Canquenes Baths.

Labus sichelianus.

Labus sichelianus, Sauss. Am. Wasps (Smithsonian Misc. Coll. xiv.), p. 56, pl. iv. fig. 20 (1875).

This species does not exist in any collection in Chile.

Discoelius merula.

Discoelius merula, Curtis, Trans. Linn. Soc. xvii. p. 325 (1834).
Epipona chilensis, Spin. l. c. p. 248 (1851).
Discoelius spinolæ, Sauss. Vesp. i. p. 25 (1852).

The male of this species is unknown. It is very rare; I have found only two specimens in the 25 years that I have collected in Chile.

Monobia cyanipennis.

Odynerus cyanipennis, Guérin, Voy. Coq., Ins. p. 264, pl. ix. fig. 5, ♂ (1830).

I once saw a specimen of this species caught in Peru, and I am convinced that it does not occur in Chile to the south of Atacama. It probably occurs, however, in the northern provinces annexed from Peru.

ODYNERUS AMBIGUUS.

♀. *Odynerus ambiguus*, Spin. l. c. p. 264 (1851).

♂. *Odynerus bustillosii*, Sauss. in Gay, vi. Supp. p. 567 (1852).

This and the two following species belong to Wesmael's subgenus *Ancistrocerus*. *O. ambiguus* is probably a common and variable species, of which I have many specimens and varieties, but no specimens that I have seen agree fully with the description.

ODYNERUS SCABRIUSCULUS.

Odynerus scabriusculus, Spin. l. c. p. 262 (1851).

The original description of this species in Gay's work is so thoroughly bad, like many other descriptions in that work, that in the Latin diagnosis a male is described as the female, and the Spanish part is full of absurd errors.

De Saussure afterwards published a fair description from the type that exists in the Paris Museum.

This species is local, but not uncommon in Colchagua.

ODYNERUS VICINUS, sp. nov.

Allied to *O. scabriusculus*, but larger, less coarsely punctured, and with a yellow band on the scutellum.

♀. Slender, head and thorax strongly punctured, 1st and 2nd segments of the abdomen finely punctured; anterior margin of prothorax recurved, angles rounded. Suture on 1st abdominal segment well defined, angular in the middle. Black, shining, head and thorax densely covered with short reddish hairs; antennæ reddish beneath; legs pitchy, tarsi and knees reddish. A small spot behind the eyes, anterior margin of prothorax, tegulæ, a spot near root of wing, the posterior margin of the scutellum, posterior margin of the first two abdominal segments, yellow.

A small but distinct tubercle exists beneath the 1st abdominal segment; 2nd segment not tuberculated, but thickened anteriorly, the elevation forming a ridge. The tooth on posterior margin of the metathorax is very distinct, but hardly so large as in *O. scabriusculus*.

Length 11 millim., wing 6 millim.

One specimen caught near Valparaiso.

ODYNERUS EXCIPIENDUS.

Eumenes excipiendus, Spin. l. c. p. 266 (1851).

Odynerus arcuatus, Sauss. Vesp. i. p. 160 (1852).

This species, according to the original description by Spinola, has the terminal joints of the male antennæ red, as in my specimens. But Saussure, in his 'American Wasps,' makes his *O. colocolo*, with terminal joints black and a tubercle on the upper side of the 2nd abdominal segment, to be the true *O. excipiendus*.

I have never seen *O. colocolo*, so cannot say whether it is a good species or not, but my specimens of *O. excipiendus*, Spin., fully agree with Spinola's description and with the description of *O. arcuatus*.

ODYNERUS COLOCOLO.

Odynerus colocolo, Sauss. in Gay, p. 566 (1852).

This must be a notable species if specimens agree with the description.

ODYNERUS SUBPETIOLATUS.

Odynerus subpetiolatus, Sauss. Vesp. i. p. 162 (1852).
Odynerus coarctatus, Sauss. in Gay, p. 565 (1852).

De Saussure published two descriptions of this species almost simultaneously, but he states that the name of *O. petiolatus* was published first.

This species is common in Central Chile. It is very much like *O. labiatus*, but smaller and has no tubercle beneath the second abdominal segment.

ODYNERUS TUBERCULATUS.

Odynerus tuberculatus, Sauss. in Gay, p. 564 (1852).

Allied to *O. humeralis*, but smaller, with a small tubercle on the upper surface of the first abdominal segment; differs also in the form of the metathorax and in colours.

This species must be very rare, as I have looked for it for many years and have obtained only one specimen, which I caught near Valparaiso.

ODYNERUS TUBERCULIVENTRIS.

Eumenes tuberculiventris, Spin. l. c. p. 267 (1851).

This common little species is easily recognized by its large tubercle on the underside of the second abdominal segment in both sexes, and by the yellow coxæ of the males.

ODYNERUS MOLINÆ.

Odynerus molinæ, Sauss. in Gay, p. 562 (1852).
Odynerus molinius, Sauss. Vesp. iii. p. 251 (1854).

Described from a single specimen, female, said to exist in the Paris Museum. From the description it would appear to be allied to *O. labiatus*, perhaps a variety.

ODYNERUS LABIATUS.

Odynerus labiatus, Haliday, Trans. Linn. Soc. xvii. p. 323 (1837).
Odynerus lachesis, St.-Farg. Hym. ii. p. 667 (1841).
Odynerus maryinicollis, Spin. l. c. p. 256 (1851).

One of the most common Chilian species.

ODYNERUS CAUPOLICANUS, sp. nov.

Allied to *O. labiatus*, but with yellow tegulæ and yellow markings on scutellum, postscutellum, and metathorax.

♂. Head and thorax coarsely punctured, clothed with short, reddish hairs, dull black; abdomen finely punctured, velvety. Antennæ and legs ferruginous, tarsi and coxæ darker. Post-

scutellum elevated, metathorax rounded at the sides and not higher at any part than the base of the postscutellum. Pronotum, except its posterior angles, tegulæ, a spot under root of wing, two spots on the scutellum, two on the postscutellum, two on either side of metathorax, extremity of the first three abdominal segments, sulphur-yellow. The 2nd and 3rd abdominal rings are continued beneath, but interrupted in the middle.

Terminal joint of antennæ long, blunt, curved, the apex being thus rather spiral than hooked.

Length 13 millim., wing 10 millim.

Caught at the Canquenes Baths.

ODYNERUS VESTITUS.

Odynerus vestitus, Sauss. Vesp. iii. p. 252 (1854).

I have never seen this species.

ODYNERUS HUMERALIS.

Odynerus humeralis, Haliday, Trans Linn. Soc. xvii. p. 324 (1837).

Odynerus chilensis, St.-Farg. Hym. ii. p. 643 (1841); Gay, l. c. p. 235 (1851).

The largest Chilian species. Very common.

ODYNERUS VILLOSUS.

Odynerus villosus, Sauss. in Gay, p. 563 (1852).

Described from a female specimen. Appears to be like *O. vespiformis*. It does not exist in any collection in Chile.

ODYNERUS OBSCURIPENNIS.

Odynerus obscuripennis, Spin. l. c. p. 259 (1851).

Odynerus coquimbensis, Sauss. in Gay, p. 561 (1852).

I unite these two descriptions on the authority of De Saussure. Gay's description was drawn up from an incomplete specimen. Probably De Saussure's was taken from the same fragment, which might have been a var. of *O. humeralis*.

ODYNERUS ANTUCO.

Odynerus antuco, Sauss. in Gay, vi. p. 562 (1851).

Odynerus antucensis, Sauss. Vesp. iii. p. 228 (1854).

Said to be the only Chilian species with a single abdominal belt. It is a pity it has not a single name also. I do not know the species.

ODYNERUS CHILIOTUS.

Odynerus chiliotus, Sauss. in Gay, vi. p. 566 (1852).

Described from a single male specimen. Unknown in Chilian collections.

ODYNERUS MAYPINUS.

Odynerus maypinus, Sauss. in Gay, p. 564 (1852).

Also described from a single male specimen. May possibly be the male of *O. antuco*.

ODYNERUS RUFICOLLIS.

Odynerus ruficollis, Spin. l. c. p. 259 (1851).

Described from a single female specimen.

ODYNERUS VESPIFORMIS.

Odynerus vespiformis, Haliday, Trans. Linn. Soc. xvii. p. 323 (1837).

Odynerus hirsutus, Spin. l. c. p. 257 (1851).

A very common and distinct species.

ODYNERUS GAYI.

Odynerus gayi, Spin. l. c. p. 260 (1851).

A northern species; commoner in Copiapo than to the south.

ODYNERUS SOTOI, sp. nov.

Allied to *O. gayi*, but larger, stouter, and with the last joint of antennæ in male recurved, forming a hook.

♀. Head finely and closely, thorax thickly and roughly, punctured. Abdomen finely and distantly punctured. Head and thorax dull, abdomen shining, black. Antennæ, legs, and clypeus rust-red. A spot above the insertion of the antennæ, a line behind the eyes, anterior $\frac{2}{3}$ of pronotum, tegulæ, spot at root of wings, two squarish spots on scutellum, a line on postscutellum, posterior margins of metathorax, extremity of the first three abdominal segments, reddish yellow. Coxæ black, intermediate pair reddish anteriorly.

Clypeus hexagonal, very wide above; legs stout; apex of tibiæ and tarsi with short spiny hairs.

Length 15 millim., wing 11 millim.

I received specimens of this species, from Copiapo, in alcohol, which may account for the reddish tint of its markings; these are probably yellow during life. I have only one male, not in good condition, so that I cannot describe it at length.

ODYNERUS ARAUCANUS.

Odynerus araucanus, Sauss. Reise Novara, Hym. p. 14, pl. 1. fig. 8 (1868).

I do not know this species.

ALASTOR ANGULICOLLIS.

Odynerus angulicollis, Spin. l. c. p. 261 (1851).

Very rare. I have one male specimen.

CTENOCHILUS PILIPALPUS.

Epipona pilipalpa, Spin. l. c. p. 252 (1851).

This species was based on a single female specimen. I have never seen it.

7. On a new Species of *Drepanis* discovered by Mr. R. C. L. Perkins. By ALFRED NEWTON, F.Z.S. (Communicated on behalf of the Joint Committee, appointed by the Royal Society and the British Association, for the Zoological Exploration of the Sandwich Islands.)

[Received November 7, 1893.]

The severe labours undergone by Mr. Perkins, who has for some months past been exploring Molokai, one of the Sandwich Islands, have met with a suitable reward in the unexpected discovery of a new species of *Drepanis*, of which he has sent home several specimens; and, in describing it at his request, I feel bound to express the satisfaction of the Joint Committee under whose direction he has been working, coupled with my own regret that his modesty hinders him from introducing his discovery to the world. Its sombre plumage and the sad fate that too probably awaits the species induce me to propose for it the name of

DREPANIS FUNEREA.

Diagn.—*Atra, remigibus manualibus externè grisei-limbatis, rostro valdè decurvato, maxillâ mandibulam multò transeunte.*

Long. tot. 8; *alæ* 4; *caud.* 2·75; *rostri culminis* 2·5; *tarsi* 1·25 *unce.*

Hab. in montibus sylvestribus insulæ Molokai.

The sexes are outwardly alike. Mr. Perkins states that the nasal opercula and the base of the bill between the nostrils are yellow, especially in the young; the irides "pale yellowish-brown."

It would be easy to point out characters that in the eyes of some writers would justify the foundation of a new genus for this bird. At first sight the configuration of its bill naturally suggests the genus *Hemignathus*; but closer inspection shows that in its breadth and height at the base it wholly agrees with *Drepanis*, as restricted by modern authors, only differing therefrom in its exaggerated maxilla. Some inequality in the length of the mandibles is, however, exhibited by *D. pacifica*, and the examples of the new species sent by Mr. Perkins show no little variability in this respect. For the rest it is distinct enough, its almost lustreless black plumage not being relieved by any yellow feathers, though the patch of that colour at the base of the maxilla must be a conspicuous feature in life.

November 21, 1893.

Sir W. H. Flower, K.C.B., LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of October :—

The registered additions to the Society's Menagerie during the month of October were 121, of which 57 were by presentation, 27 by purchase, 3 by birth, and 34 were received on deposit. The number of departures during the same period, by death and removals, was 106.

The most noticeable additions during the month were :—

1. An example of the Goliath Beetle (*Goliathus druryi*), one of the largest of known Coleoptera, obtained near Accra, Gold Coast, and presented Oct. 5th by F. W. Marshall, Esq.

2. An adult female and a young of the Manatee (*Manatus americanus*), captured in Manatee Bay, Jamaica, and most kindly sent home for the Society's Collection by Sir Henry A. Blake, K.C.M.G. Unfortunately they reached the Gardens in a very exhausted condition, and died soon after their arrival.

Mr. Sclater exhibited a mounted specimen of an African Monkey (*Cercopithecus albigularis*) from the Leyden Museum, and made the following remarks :—

Dr. Jentink has kindly sent to me from the Leyden Museum for comparison a West-African example of *Cercopithecus albigularis*, which I now exhibit. It was obtained by Pel on the Gold Coast, and therefore there can be no doubt as to its locality In my paper on the Monkeys of this genus, P. Z. S. 1893, p. 251, I commented upon the strange fact that this Monkey, which we commonly receive from Mozambique and various ports in East Africa, should also occur in West Africa, and suggested that specimens from the two countries should be compared. I have placed the present specimen side by side with the original type of Sykes (described P. Z. S. 1831, p. 106), now in the British Museum, and must admit that I can find no grounds for specific distinction. Sykes's specimen was originally living in the Society's Gardens, and its locality (given by Sykes as Madagascar) is absolutely uncertain; but of two East-African specimens obtained on the Rufiji River opposite Zanzibar, 8° S. lat., by Capt. Wharton, R.N., F.R.S., and now in the British Museum, one agrees very well with the present specimen, though, as a general rule, East-African specimens (of which we have two now living in the Gardens) have a strong rufous tinge round the anus under the tail, which is not apparent in the present example. On the whole, however, I am not at present prepared to say that East and West African specimens of this Monkey can be properly distinguished.

An extract was read from a letter addressed to the Secretary by Mr. J. S. Mackay, dated Dunbar House, Kullu, Punjaub, 10th June, 1893, relating to a young Snow-Leopard, then about one year old, which had been sent to Mrs. Mackay as a present from Thakur Debi Chand, of Gundla, in Lahaul, when quite small. Mr. Mackay wrote:—"The animal is well over six feet now. He is kept tied to a thin long cord during the day on the tennis-court in the shade, where he gambols and plays with the dogs. At night he is let loose inside the house and sleeps on my wife's bed. I have never known or heard of anyone exercising such a peculiar fascination over any animal as my wife does over this Snow-Leopard. He follows her about like a dog, and if he misses her a moment he simply screams for her."

Several photographs representing this animal were exhibited.

Mr. W. B. Tegetmeier, F.Z.S., exhibited some hybrid Pheasants supposed to be crosses between the Common Pheasant (*Phasianus colchicus*) and the Gold Pheasant (*Thaumalea picta*), and between the first-named bird and the Silver Pheasant (*Nycthemerus argentatus*).

The following papers were read:—

1. On the Spiders of the Family *Attidæ* of the Island of St. Vincent. By G. W. and E. G. Peckham.[1]

[Received October 24, 1893.]

(Plates LXI. & LXII.)

The Spiders of the family Attidæ described in the following paper were collected on the Island of St. Vincent by Mr. Herbert H. Smith, the collector sent out by Mr. F. DuCane Godman to assist the Committee for the Exploration of the Fauna and Flora of the West Indian Islands, appointed by the British Association and by the Royal Society.

The Committee has agreed to place a full series of these Spiders in the British Museum.

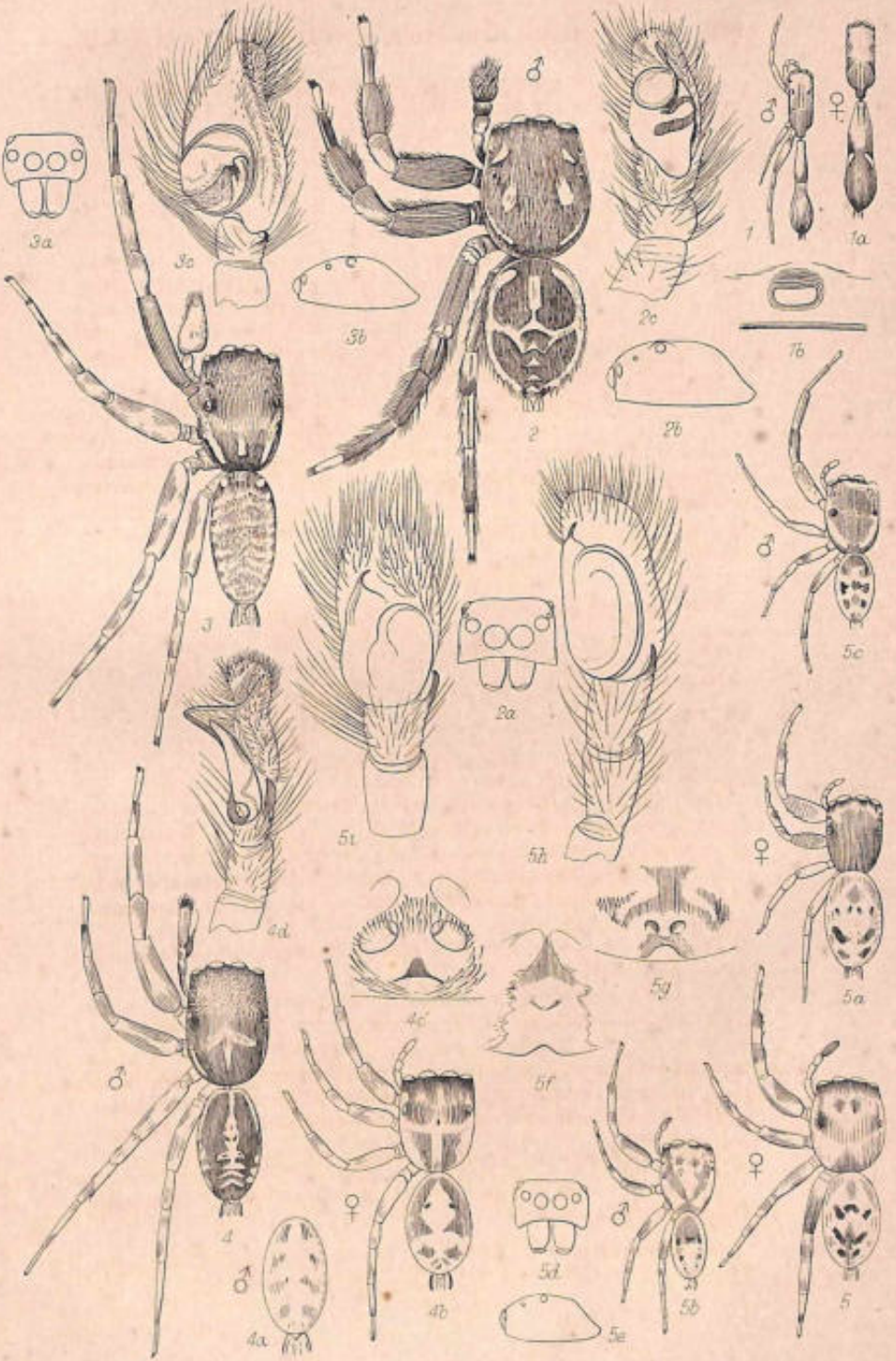
We had expected to have made this collection the basis of a discussion of the relations of the Spiders of the West Indian Islands to those of the mainland, but the material in our hands is too scanty to warrant any important conclusions. We hope, before long, to receive enough material to make the discussion desirable.

In making the measurements we have used the metric system.

Synemosyna smithi, sp. nov. (Plate LXI. figs. 1–1 *b*.)

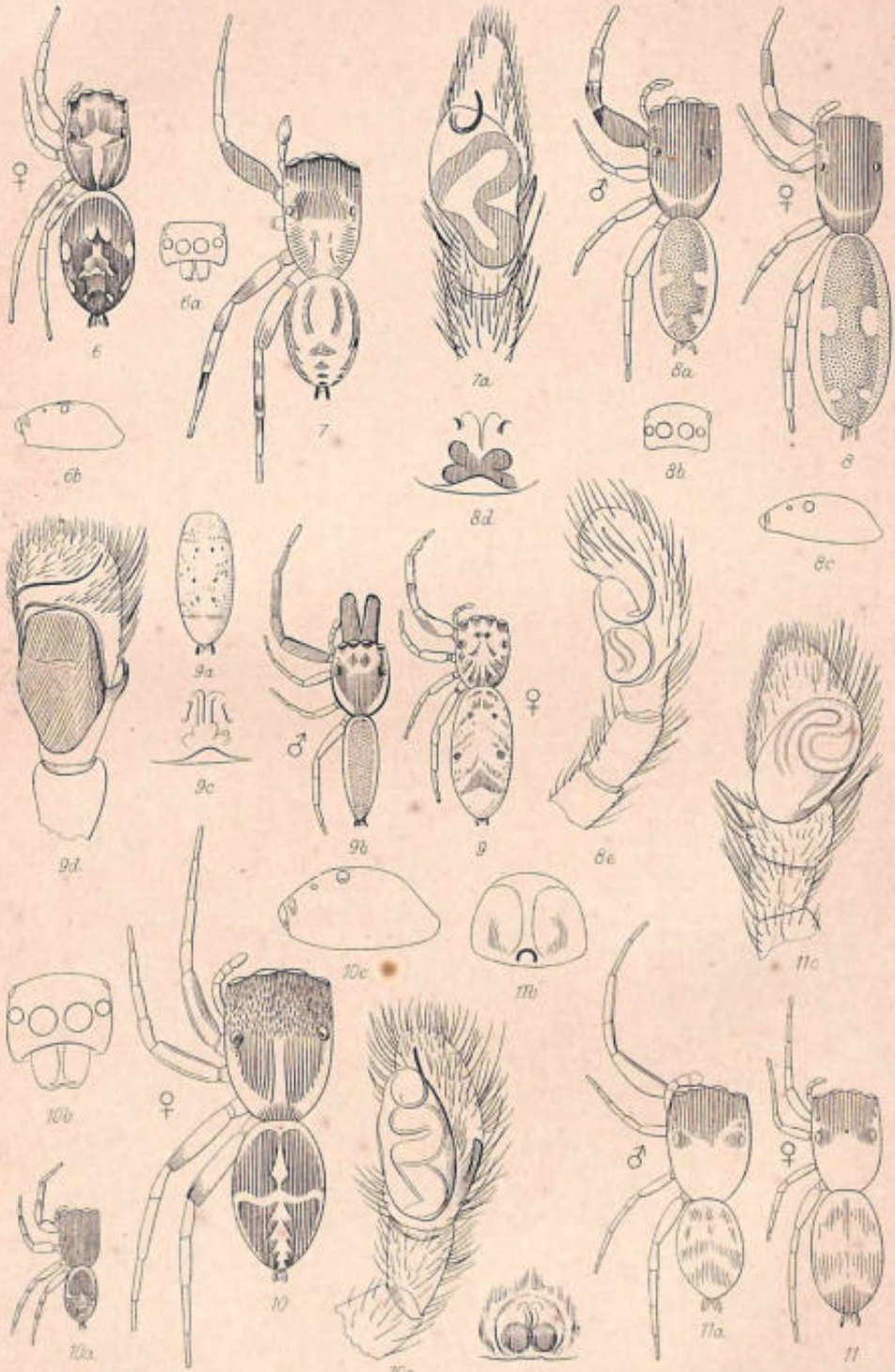
♂ and ♀. Length 4·2. Length of cephalothorax 1·8; width of cephalothorax 9.

[1] Communicated by D. Sharp, F.R.S., F.Z.S., on behalf of the Committee for Investigating the Flora and Fauna of the West Indian Islands.



Edwin Wilson Cambridge.

SPIDERS OF THE FAMILY ATTIDÆ FROM ST VINCENT.



Edwin Wilson, Cambridge.

SPIDERS OF THE FAMILY ATTIDÆ FROM ST. VINCENT.

Legs, ♂ and ♀, 4, 3, 1, 2. The femur of the fourth leg is enlarged, especially in the male.

The cephalothorax is narrow and long—twice as long as wide. The sides are nearly parallel until the posterior quarter of the thoracic part, where the cephalothorax grows abruptly narrower. The cephalic part is on a higher plane than the thoracic and has its sides inclined inwards. The thoracic part is rounded in its anterior three-fourths, the posterior end, where it joins the abdomen, being flattened. There is a constriction at a little distance behind the dorsal eyes. The quadrangle of the eyes is nearly equally wide and long, is wider behind than in front, and occupies about one-third of the cephalothorax. The first row of eyes is strongly bent; the eyes are close together, the middle being twice and a half as large as the lateral. The second row is nearer the first than the third row. The dorsal eyes are larger than the lateral and form a row which is as wide as the cephalothorax at that place. The clypeus is narrow. The labium is wider than long. The sternum is long and narrow. The abdomen is very long and has a constriction in the middle; it is narrowest in front, tapering gradually toward the anterior end. The integument of the anterior part is slightly hardened above, on the sides, and below. The falces are moderately stout and long and are vertical.

The cephalic plate and the anterior thoracic part are yellow, with the eyes on black spots; there are some white hairs on the anterior part; between the dorsal eyes are two fine dark lines; the rest of the upper surface is brown, darkening toward the posterior end, with a thin covering of white hairs, and having white bands around the two constrictions. The spinnerets are light-coloured. The legs are white or light brown, excepting the femoral joints of the third and fourth pairs, which are rufous. The falces are reddish. The palpi, mouth-parts, and coxæ are white. The sternum and venter are yellowish, the venter being blotched with white.

KEYSERLINGELLA MINUTA, sp. nov.

♀. Length 3. Length of cephalothorax 1·3; width of cephalothorax ·8.

Legs 4, 3, 1, 2, all slender.

The cephalothorax is rather short, with a slight constriction just behind the dorsal eyes. The cephalic part is flat, and is on a higher plane than the thoracic which is rounded, and falls quite steeply from the ridge behind the constriction. The sides are parallel. The abdomen is rounded, and is widest behind the middle and narrow at both ends. The clypeus is narrow. The quadrangle of the eyes is one-fourth wider than long, is wider behind than in front, and occupies about one-half of the cephalothorax. The first row is curved; the eyes are close together, the middle twice as large as the lateral. The second row is halfway between the first and the third. The dorsal eyes are larger than the lateral and are on the sides of the head. The sternum is wide and is truncated

in front. The maxillæ are twice as long as the labium. The labium is as wide as long.

The cephalothorax is dark rufous. In alcohol the abdomen is transversely banded with dark and pale rufous, with a wide dark band near the posterior end. When dried the anterior half is rufous with two transverse curved bands of white hairs; behind the second of these is a wide blackish band and between this and the spinnerets the colour is rufous. The palpi are pale. The legs are light rufous, the first pair unmarked, the second, third, and fourth with a black line running along the anterior face.

This spider is immature, but seems to belong to the genus *Keyserlingella*.

DYNAMIUS METALLICUS, sp. nov. (Plate LXI. figs. 2–2*c*.)

♂. Length 6·8. Length of cephalothorax 3; width of cephalothorax 2·4.

Legs 3, 4, 2, 1, nearly equal in length; the first three pairs stouter than the fourth.

The cephalothorax is high and convex. The cephalic part is inclined forward and has the sides nearly vertical and parallel. The thoracic part has a nearly plane semicircular plate behind the dorsal eyes, from which it rounds downward on the sides and behind; it is very much narrower on the upper surface than below, the sides being concave. The quadrangle of the eyes is a little wider in front than behind, is one-fourth wider than long, and occupies not quite two-fifths of the cephalothorax. The eyes are all large. The first row is plainly curved with the eyes a little separated, the middle being less than twice as large as the lateral. The second row is halfway between the first and third rows. The dorsal eyes are a little smaller than the lateral and form a row which is not quite so wide as the cephalothorax, although it is as wide as the upper surface. The clypeus is two-thirds as high as the middle eyes of the first row. The falces are slightly retreating, short and not very stout. The sternum is wide and is truncated in front and behind. The maxillæ are short and are widely separated. The labium is fully as wide as long.

The whole appearance of this spider is big, black, and burly. The cephalothorax is ornamented with a pair of snow-white spots on the cephalic and another on the thoracic part, while the sides are encircled by a wide white band. On the black abdomen is a pattern in yellowish white with a tinge of red, consisting of an encircling band, a central, longitudinal, dorsal band, which in the posterior half is broken up into spots, and a curved transverse band on each side of the dorsum behind the middle. The palpus has the femur and the proximal end of the patella covered with white hairs. The first two pairs of legs have the joints much enlarged and rounded; in the third pair they are also enlarged but are lengthened out; the first, second, and third pairs have fringes of white hairs, and have all the joints, excepting the tarsi, iridescent, with brilliant violet reflections. Some of this iridescence is also seen on

the upper surface of the cephalic part. The under surface is black.

CYBELE, gen. nov.

The cephalothorax is rounded, convex and rather high, highest at the dorsal eyes; the cephalic part is plainly inclined. The quadrangle of the eyes is slightly wider in front than behind, is one-fourth wider than long, and occupies two-fifths of the cephalothorax. The middle eyes of the first row project beyond the lateral and almost touch each other; the lateral are a little separated from the middle (more widely in *vincenti* than in *obscura*); they are unusually large, almost two-thirds as large as the middle eyes. The second row of eyes is nearer the third than the first row.

Cybele bears some resemblance to *Amycus*, but its general appearance is not so rounded, its sides are more nearly parallel, and the eyes of the first row are more nearly of a size, the middle ones of this row in *Amycus* being twice as large as the lateral. It also recalls *Hasarius*, but in this latter genus the eyes of the first row are much smaller and the thoracic part is flatter.

CYBELE OBSCURA, sp. nov. (Plate LXI. figs. 3–3*c*.)

♂. Length 7. Length of cephalothorax 3; width of cephalothorax 2.

♀. Length 7. Length of cephalothorax 2·8; width of cephalothorax 2.

Legs, ♂ 1, 3, 4, 2, ♀ 3, 4, 1, 2, all nearly equally long. The first and second are a little the stoutest.

The cephalothorax has its sides nearly vertical in front, but in the thoracic part they are rounded out, more plainly than in *vincenti*; its widest point is a little behind the dorsal eyes. The thoracic part falls a very little in the first third of its length and then slants steeply. The first row of eyes is straight. The dorsal eyes are a little smaller than the lateral and are placed on the sides of the cephalothorax, which, however, is wider than this row below. The clypeus is half as high as the middle eyes of the first row. The falces in both sexes are vertical, parallel, and rather long and stout, with short fangs. The maxillæ are considerably longer than the labium and are widened at the extremities. The sternum is not much longer than wide, but is not so nearly round as in *vincenti*.

In colour and marking *C. obscura* is a good deal like *vincenti*. The cephalothorax is bright red, with a white band on each side and a third in the central thoracic region. The abdomen is covered with white and red hairs, giving it a tawny look; the anterior end is black and has two pairs of white bars, one above the other, and a bunch of black hairs projecting toward the cephalothorax. A line of fine white chevrons formed of hairs is faintly visible down the central line of the dorsum. The legs are brown, mottled and barred with red, white, and black. The tarsus and proximal end of the metatarsus of the first are not pale as in *vincenti*, and there is

no fringe of hairs on the underside. The spinnerets are long and pale, the outer ones having a dark line along the external side.

A common species.

The two species of *Cybele* may be distinguished from each other by the following points:—In *C. vincenti* the thoracic part slants steeply from the dorsal eyes, while in *C. obscura* it falls gradually at first; in *C. vincenti* the falces of the male are oblique and diverging, in *C. obscura* vertical and parallel; and in *C. vincenti* the palpus of the male has the tarsus twice as long as the tibia and not much longer than wide, while in *C. obscura* it is three times as long as the tibia and twice as long as wide, projecting for some distance beyond the bulb.

CYBELE VINCENTI, sp. nov. (Plate LXI. figs. 4–4 *d*.)

♂. Length 6. Length of cephalothorax 2·8; width of cephalothorax 2.

♀. Length 6·5. Length of cephalothorax 2·5; width of cephalothorax 1·8.

Legs, ♂ 1, 4, 3, 2, ♀ 4, 3, 1, 2. The first leg is stouter than the others and, in the male, is longer than the second by the metatarsus and tarsus.

The cephalothorax has its sides nearly vertical in front and slightly rounded out in the thoracic part; it is widest, as well as highest, at the dorsal eyes, and from this point it falls quite steeply, the slope being slightly rounded out. The first row of eyes is a little curved; the lateral eyes of this row are relatively a little smaller than those of *obscura*. The dorsal eyes are a little larger than the lateral and are placed on the sides of the cephalothorax, forming a row that is as wide as the cephalothorax at that place. The clypeus is one-fourth as high as the middle eyes of the first row. The patella and tibia of the male palpus are of the same length, and taken together are shorter than the tarsus, which is twice as long as wide; the palpal tube is very long. The falces of the male diverge widely and have long fangs; they are vertical and rather stout; those of the female are short, parallel, vertical, and rather stout, with short fangs. The maxillæ are not much longer than the labium. The sternum is almost round.

The markings vary considerably in different spiders of this species, and some are much darker coloured than others. The cephalothorax in the male is covered with brilliant red hair and has a snowy white band on each side and another in the central thoracic part. The abdomen is covered with a mixture of grey, red, and tawny hairs; around the anterior end is a curved white band, and from this a central, longitudinal, white band extends backward to about the middle of the dorsum. Sometimes a central band of white figures appears on the posterior half, with two dark rufous spots on each side. The clypeus has a fringe of white hairs on the lower edge. The falces are brown. The legs are banded with lighter and darker brown, the first and second being somewhat darker than the third and fourth. The first leg has

the tarsus and the proximal end of the metatarsus pale, and has fringes of black hair under the femur and the tibia. The spines are black.

In the female the whole spider is lighter coloured, the integument being brown, and there is less of the bright red than in the male. The ground-colour of the abdomen is a soft velvety reddish brown. The markings are like those of the male, and are equally variable. In both sexes the spinnerets are rather short, the external ones being covered with brown and the middle ones with white hairs.

A common species.

Dendryphantes octo-punctatus, sp. nov. (Plate LXI. figs. 5–5 *i*.)

♂. Length 5·5. Length of cephalothorax 2·5; width of cephalothorax 2. Some males are considerably smaller, having a total length of about 3·5.

♀. Length 4·4. Length of cephalothorax 2; width of cephalothorax 1·8.

Legs, ♂ 1, 4, 2, 3; the first is stouter than the others and, especially in the larger variety, is much the longest, exceeding the second by the tarsus, metatarsus, and nearly all of the tibia; the others are nearly equal. ♀ 4, 1, 2, 3; the first is a little the stoutest.

The cephalothorax is scarcely longer than wide; the sides are curved, the widest point being behind the dorsal eyes. It is high, the highest point being at the dorsal eyes, the cephalic part falling slightly toward the first row of eyes, while the thoracic part rounds backward and downward quite abruptly in its first third and then falls still more steeply. The whole of the upper surface is rounded. The quadrangle of the eyes is one-third wider than long, is wider behind than in front, and occupies a little more than two-fifths of the cephalothorax. The first row of eyes is a little curved; the middle eyes are separated slightly from each other and more widely from the lateral eyes. The lateral are a very little more than one-half as large as the middle eyes. The second row of eyes is nearer the first than the third row. The third row is plainly not so wide as the cephalothorax at that place. The clypeus is narrow. The falces of the male are stout, rather long, with long strong fangs, diverging and somewhat obliquely directed forward, so that they are sometimes visible from above; those of the female are rather stout and long, parallel, and vertical. The sternum is oval. The maxillæ are fully twice as long as the labium and are rounded. The labium is longer than wide.

In the male the integument is of a rich dark brown colour. The upper surface of both cephalothorax and abdomen seems to have been covered with yellow hairs or scales. There are two wide snow-white bands on the sides of the cephalothorax, and a curved white band around the anterior end and the sides of the abdomen. On the dorsum are eight dark spots on a light ground,

four in a transverse row across the anterior part and two on each side, farther back. The two middle spots of the transverse band are frequently joined together. There are some red hairs around the eyes of the first row, and the front faces of the first legs; the palpi and the falces are all covered with snow-white rice-like scales, so that the spider presents a very showy appearance from in front. The legs are brown with a good many white scales, the first pair being darker coloured than the others.

The female has the integument of the cephalothorax dark brown, while that of the abdomen is commonly yellowish. The whole surface is covered with white scale-like hairs, excepting that on the abdomen there are eight black spots, four in a transverse row across the middle of the dorsum and two on each side, farther back. The legs are yellowish. The clypeus is covered with rather long white hairs, which hang down a little way over the falces.

The general appearance of this species is much like that of *Dendryphantes capitatus*, Hentz. It seems to be very common in St. Vincent.

HASARIUS PAYKULLI, Aud. in Sav. Descr. de l'Egypte, 2e édit. xxii. p. 172.

A cosmopolitan species.

CYRENE, gen. nov.

The cephalothorax is only moderately high; from its highest point, at the dorsal eyes, it falls forward to the first row of eyes and backward for about two-thirds of the length of the thoracic part, the forward inclination being a little more pronounced than the backward. The final fall to the posterior border is steep. The sides are nearly vertical and parallel in the cephalic part, but are a good deal rounded out in the thoracic, the widest point being considerably behind the dorsal eyes. The quadrangle of the eyes is equally wide in front and behind, is barely one-fourth wider than long, and occupies two-fifths of the cephalothorax. The first row of eyes is straight, the middle eyes being about twice as large as the lateral and close together, while the lateral are a little separated from them. The second row is halfway between the first and the third row. The dorsal eyes are about as large as the lateral, and form a row which is nearly as wide as the cephalothorax at that place.

This genus is close to *Mævia*, but the cephalothorax has a more rectangular appearance, the lower edge being almost straight.

CYRENE DECORATA, sp. nov. (Plate LXII. figs. 6–6 *b*.)

♀. Length 5·8. Length of cephalothorax 2·2; width of cephalothorax 1·4.

Legs 4, 3, 1, 2, nearly equally stout, the femoral joints of the first and second being a little thickened.

The clypeus is one-fourth as high as the middle eyes of the first row. The falces are moderately long and stout, vertical and

parallel. The sternum is narrowed and truncated in front and rounded behind. The maxillæ are twice as long as the labium, which is short, wide, and squarely truncated. The abdomen is widest in the middle.

The cephalic part is bright red. There is a wide white band on each side and a central white band on the thorax; the rest of the thoracic part is darker than the cephalic, but is decidedly reddish. The abdomen has a black curved band around the anterior end, and above this a snow-white band. The upper surface is bright red, with two longitudinal black bands from the middle of the dorsum to the spinnerets, between which the surface is bronzed, and a number of snow-white spots which form a handsome and effective pattern (see drawing). Two of these are in the middle of the abdomen just in front of the bronze region; two more appear at the edge of the bronze region on each side; and two larger spots, also snow-white, are found on each side of the abdomen in the red region.

The middle spinnerets are pale, the external ones black. The legs are light coloured, irregularly dotted with black. The clypeus is covered with long white hairs. The falces and mouth-parts are dark reddish brown. The sternum is light brown. The venter is covered with white hairs and is dotted with black.

A single specimen.

We have examples of this species in the Smith collection from Santarem, the Brazilian variety being larger. It has a general resemblance to *Euophrys coronigera* of C. Koch.

EUOPHRYS (?) PULCHELLA, sp. nov. (Plate LXII. figs. 7, 7 *a*.)

♂. Length 3. Length of cephalothorax 1·5; width of cephalothorax 1.

Legs 4, 3, 1, 2.

The cephalothorax is high and looks rather long and heavy compared to the abdomen. The sides are nearly parallel and vertical, but widen out a little at the posterior end. The highest point is at the dorsal eyes. The cephalic part is gently inclined, and the anterior two-thirds of the thoracic part falls a little more abruptly. The final slope of the thoracic part to the margin is steep. The four anterior eyes are close together in a curved row; the lateral are two-thirds as large as the middle eyes. The second row is a little nearer the third than the first row. The third row is as wide as the cephalothorax at that place, the eyes being nearly as large as the lateral eyes of the first row. The clypeus is narrow. The falces are short, vertical, and parallel. The sternum is wide, slightly rounded in front and pointed behind. The maxillæ are widely separated and are truncated at the extremities. The labium is very small and is as wide as long.

Our single specimen of this species is so badly rubbed that the colour can only be guessed at. The cephalothorax is dark brown with a black line around the lower margin, and seems to have been pretty well covered with white hairs. The abdomen is lighter

brown, with a pale herring-bone stripe down the middle of the dorsum and a good many white hairs on the sides. The legs and palpi are light brown, the legs having some dark rings. The falces are dark brown. The under surface is light brown.

This spider is immature. It is not a very good *Euophrys*, but as it is near that genus we put it there provisionally.

Cydonia, gen. nov.

The cephalothorax is low and is almost flat above. The cephalic part is very slightly inclined, and the thoracic part falls scarcely at all in the anterior half and then slopes abruptly to the margin. The sides are narrowest in front; they widen a little just behind the dorsal eyes and then contract gradually as they pass backward; in the cephalic part they slant inward, but in the thoracic part they are gently rounded. The quadrangle of the eyes is wider behind than in front, is one-fifth wider than long, and occupies one-half of the cephalothorax. The four anterior eyes are placed close together in a straight row, the middle being nearly twice as large as the lateral. The second row is nearer the first than the third row. The dorsal eyes are fully as large as the lateral eyes of the first row and are placed on the margin of the cephalothorax. The labium is longer than wide.

Cydonia is somewhat like *Epiblemum*, but differs from that genus in that the quadrangle of the eyes is wider behind than in front and occupies one half of the cephalothorax.

Cydonia luteola, sp. nov. (Plate LXII. figs. 8–8 *c*.)

♂. Length 3. Length of cephalothorax 1·5; width of cephalothorax 1.

♀. Length 3·8. Length of cephalothorax 1·5; width of cephalothorax 1.

Legs, ♂ ♀, 4, 1, 3, 2. The first pair is much the stoutest in both sexes, all the joints excepting the metatarsus and tarsus being thickened.

The clypeus is narrow. The falces are only moderately long and stout; in the male they diverge and are directed obliquely forward, the fang being as long as the falx; in the female they are vertical and parallel with the fang, short. The sternum is oblong. The maxillæ are rounded and are less than twice as long as the labium. The abdomen is long in proportion to the cephalothorax and is about twice as long as wide.

The cephalothorax is black in the cephalic region, shading into rufous behind; the upper surface is covered with bright yellow hairs and there is a band of white hairs on each side. The abdomen is light brown covered with silvery down, and on each side is a longitudinal white band. Touching these lateral bands are two pairs of short white bands or spots, the first pair near the middle and the second near the spinnerets. The first leg has the

femur, tibia, and a ring at the distal end of the metatarsus rufous, the remainder being pale; in the female the rufous is not so dark as in the male. The other legs are pale. The palpus of the male is black covered with white hairs, excepting the tarsus, which is pale. The palpus of the female is all pale. In both sexes the falces are dark rufous and glossy.

Marptusa melanognatha, H. Lucas, Webb and Berthelot's Hist. Nat. des Iles Canaries, tome ii. p. 29, pl. vii. fig. 4.

A cosmopolitan species.

Anoka, gen. nov.

The cephalothorax is not high and is not much longer than wide; the sides widen out gradually from the lateral eyes to their widest point, which is behind the dorsal eyes; they slant outward more widely in the thoracic than in the cephalic part. The cephalic part is inclined forward; the thoracic is level for two-thirds of its length and then falls rather steeply. The quadrangle of the eyes is one-third wider than long, is a little wider behind than in front, and occupies two-fifths of the cephalothorax. The first row of eyes is straight, with the middle eyes subtouching and less than twice as large as the lateral, which are a little separated from them. The second row is about halfway between the first and third rows. The third row is narrower than the cephalothorax at that place, the eyes being a little farther from each other than from the lateral borders. Abdomen long and slender.

We have species of *Anoka* from various parts of the United States, from Jamaica, St. Vincent, Barbados, and New Granada. They all resemble each other very strongly, even the patterns and colours being often reproduced. The relative length of the legs is 1, 4, 2, 3 or 1, 4, 3, 2 in both sexes. The males are more slender than the females and have the first legs much longer and stouter than the others and, usually, dark coloured, the other legs being pale. The males also, in all the species except *A. mitrata* and an unpublished species from Jamaica, have the falces long and horizontal; in the Jamaica species they are oblique, and *mitrata* has the falces vertical and the first legs pale. The mouth-parts are always dark coloured.

Anoka is related to *Ictus* and *Menemerus*, but in *Icius* the eyes of the first row are larger, the cephalothorax has the sides more nearly parallel and the thoracic part differently shaped (see drawing), and the abdomen is not so long and slender. In *Menemerus* the sides dilate suddenly behind the third row of eyes, the thoracic part slants more steeply from the dorsal eyes and is wider behind, although not so wide as in *Icius*, and the cephalic part is more steeply inclined.

Anoka vernalis, sp. nov. (Plate LXII. figs. 9–9 *d*.)

♂. Length 4·8. Length of cephalothorax 1·8; width of cephalothorax 1·5.

♀. Length 5. Length of cephalothorax 2·1. Width of cephalothorax 1·8.

Legs, ♂ ♀, 1, 4, 3, 2; first pair much the stoutest and longest, especially in the male.

The falces of the male are long, longer in some specimens than in others, and horizontal. Their inner edges are parallel for about one-half their length and then diverge; at this point is a tooth, which points forward and crosses the one on the opposite falx. The fang is long and slender and is slightly curved at the extremity. Those of the female are vertical, parallel, and moderately long and stout. The sternum is rather long, and is widest in the middle. The maxillæ are nearly twice as long as the labium. The labium is longer than wide.

The colour of the male is bronze-brown. A snow-white band on each side extends throughout the whole length of the cephalothorax and abdomen, the cephalothorax having a dark line around the lower margin. The eyes of the first row are surrounded by white hairs. The falces are bronze, slightly rugose above, with a band of white hairs along the outer side of each. The fangs are black. The first legs are bronze above and blackish below, and are thinly covered with white hairs. The other legs are light yellowish brown.

The female has the cephalothorax and abdomen thickly covered with a mixture of white, red, and yellow hairs. On the anterior part of the abdomen are two pairs of black dots, and across the posterior part, halfway between the middle point and the spinnerets, is a transverse black band. The legs are yellowish brown, the first pair being the darkest and having some short white hairs.

PROSTHECLINA PYGMÆA, sp. nov. (Plate LXII. figs. 10–10*c*.)

♂. Length 3. Length of cephalothorax 1·5; width of cephalothorax 1.

♀. Length 3·7. Length of cephalothorax 1·7; width of cephalothorax 1·3.

Legs, ♂ 1, 4, 3, 2, ♀ 3, 4, 1, 2; almost equally stout in both sexes.

The cephalothorax is high, the highest point being at the dorsal eyes; it is widest in front. The cephalic part is strongly inclined forward and projects over the lower margin, the sides and clypeus slanting inward. The thoracic part falls a little in the anterior two-thirds and then drops abruptly behind; the lateral slopes of this part are slightly rounded out. The quadrangle of the eyes is one-fourth wider than long, is plainly wider in front than behind, and occupies a little less than one-half of the cephalothorax. The four anterior eyes are close together and form a curved row; they are not very unequal in size, the lateral being about two-thirds as large as the middle eyes. The front face of the cephalothorax is so inclined that the eyes of this row look downward. The second row is plainly nearer the third than the first row, and the eyes are placed on the sides of the cephalothorax.

The sternum is large and almost round. The maxillæ are short and broad. The labium is very small and about as wide as long. The clypeus is about one-fourth as high as the middle eyes of the first row. The falces are moderately long and stout; they are parallel and are inclined backward.

This spider is black, ornamented with a handsome pattern in white. The cephalothorax of the male has white bands encircling the sides, a white band across the cephalothorax above the first row of eyes, another passing down the middle of the thorax, and a shorter curved band on each side, which passes up from the lateral band between the eyes of the second and third rows, and then divides, joining the band across the cephalic part in front and the thoracic band behind. The abdomen has also a number of white bands. There is a central one down the middle; a curved band on each side which joins the central one before and behind; and a transverse bar a little behind the middle, joining the central to the lateral bands, and thus dividing the dorsal surface of the abdomen into two posterior and two larger anterior black spots, surrounded by white. The legs are of rather a bright rufous. In the male the anterior faces of the tibial joints of the third pair are covered with black hairs. In the female all the femoral joints are blackish. The tibia of the palpus is covered with snow-white hairs, and there is a fringe of white hairs on the edge of the clypeus. The white band above the first row of eyes is also visible from the front, so that the face view is very striking. In the female the general colouring is like that of the male, excepting that the white band above the anterior row of eyes is lacking.

NEON POMPATUS, sp. nov. (Plate LXII. figs. 11–11 *c*.)

♂. Length 2·5. Length of cephalothorax 1·2; width of cephalothorax 1.

♀. Length 3·2. Length of cephalothorax 1·2; width of cephalothorax ·8.

Legs, ♂ 1, 4, 3, 2, ♀ 4, 1, 3, 2; first pair a little the stoutest.

The cephalothorax is high, with the cephalic part inclined forward, and the thorax falling but slightly for a very short distance behind the dorsal eyes, and then more steeply, in a long slant, to the posterior border. The quadrangle of the eyes is about equally wide in front and behind, is one-fifth wider than long, and occupies a little more than one-half of the cephalothorax. The first row of eyes is straight; the eyes are all close together and are all small, the middle being less than twice as large as the lateral. The dorsal eyes are larger than the lateral, and form a row which is as wide as the cephalothorax at that place. The eyes of the second row are nearer the dorsal than the lateral eyes. The clypeus is very narrow. The falces are short, weak, parallel and vertical. The labium is as wide as long. The sternum is nearly round. In the female the abdomen looks wide and heavy when compared with the cephalothorax.

The cephalothorax is black in the cephalic and brown in the thoracic part, sometimes thinly covered with white hairs, and having some white and rosy hairs around the eyes of the first row; around the lower border is a black line and above this is a white line. The cephalothorax seems to have been entirely covered with very brilliant iridescent scales of a rosy-golden colour, and has two white spots on each side and one just in front of the spinnerets. The legs are medium brown, the first one, in the male, being blackish on the under surface.

This is a very small spider. It does not altogether agree with the genus *Neon*, the dorsal eyes being not very large, and the slope from the dorsal eyes being less abrupt.

Lyssomanes, sp. inc.

This is an immature specimen of the subgenus *Jelskia*. The species cannot be determined. The relative length of the legs is 1, 2, 3, 4; the first leg is long and spined. The colour was probably grass-green in life, but has faded to pale yellow.

EXPLANATION OF THE PLATES.

Plate LXI.

Fig. 1. *Synemosyna smithi* (p. 692), dorsal view of male; 1 *a*, dorsal view of female; 1 *b*, epigynum.
2. *Dynamius metallicus* (p. 694), dorsal view of male; 2 *a*, face and falces; 2 *b*, side view of cephalothorax; 2 *c*, palpus.
3. *Cybele obscura* (p. 695), dorsal view of male; 3 *a*, face and falces; 3 *b*, side view of cephalothorax; 3 *c*, palpus.
4. *Cybele vincenti* (p. 696), dorsal view of male; 4 *a*, abdomen of a variety of the male; 4 *b*, dorsal view of young female; 4 *c*, epigynum; 4 *d*, palpus.
5. *Dendryphantes octo-punctatus* (p. 697), dorsal view of female; 5 *a*, dorsal view of variety of female; 5 *b*, dorsal view of male; 5 *c*, dorsal view of variety of male; 5 *d*, face and falces; 5 *e*, side view of cephalothorax; 5 *f*, epigynum; 5 *g*, variety of epigynum; 5 *h*, palpus; 5 *i*, variety of palpus.

Plate LXII.

Fig. 6. *Cyrene decorata* (p. 698), dorsal view of female; 6 *a*, face and falces; 6 *b*, side view of cephalothorax.
7. *Euophrys* (?) *pulchella* (p. 699), dorsal view of male; 7 *a*, palpus.
8. *Cydonia luteola* (p. 700), dorsal view of female; 8 *a*, dorsal view of male; 8 *b*, face; 8 *c*, side view of cephalothorax; 8 *d*, epigynum; 8 *e*, palpus.
9. *Anoka vernalis* (p. 701), dorsal view of female; 9 *a*, abdomen of variety of female; 9 *b*, dorsal view of male; 9 *c*, epigynum; 9 *d*, palpus.
10. *Prostheclina pygmæa* (p. 702), dorsal view of female; 10 *a*, dorsal view of young male; 10 *b*, face and falces; 10 *c*, side view of cephalothorax; 10 *d*, epigynum; 10 *e*, palpus.
11. *Neon pompatus* (p. 703), dorsal view of female; 11 *a*, dorsal view of male; 11 *b*, epigynum; 11 *c*, palpus.

2. A List of the Hemiptera-Heteroptera collected in the Island of St. Vincent by Mr. Herbert H. Smith; with Descriptions of New Genera and Species. By P. R. Uhler.[1]

[Received October 23, 1893.]

A. *List of Species of which specimens were obtained.*

Diolcus boscii, *Fab.*, ♂ ♀. (Uncoloured state.)
Sphyrocoris obliquus, *Germ.*
Symphylus deplanatus, *H.-Schf.*
Thyreocoris pulicarius, *Germ.*
Pangæus serripes, *Hope.*
Pangæus sp.
Amnestus subferrugineus, *Hope.*
Mormidea ypsilon (*Linn.*). Small var.
Euschistus bifibulus, *Pal. Beauv.*
Proxys victor, *Fab.*
Arvelius albopunctatus, *De Geer.*
Piezodorus guildingii, *Westw.*
Thyanta perditor, *Fab.*
—— casta, *Stål.*
Nezara viridula, *Linn.*
Edessa cornuta, *Burm.*
Spartocera diffusa, *Say.*
—— fusca, *Thunb.*
Anasa bellator, *Fab.*
—— scorbutica, *Fab.*
Acanthocerus tuberculatus, *H.-Schf.*
Hyalymenus longispinus, *Stål.*
Alydus pallescens, *Stål.*
Leptocorisa filiformis, *Fab.*
Leptoglossus balteatus, *Linn.*
Zicca tæniola, *Dallas.*
Catorhintha mendica, *Stål*, var.
Darmistidus maculatus, sp. nov.
Harmostes serratus, *Fab.*
Corizus zidæ, *Fab.* (var. *C. pictipes*, Stål).
Ochrimnus collaris, *Fab.*
Oncopeltus cingulifer, *Stål.*
—— fasciatus, *Dallas.*
—— varicolor, *Fab.*
Myodocha unispinosa, *Stål.*
Pamera serripes, *Fab.*
Sphærobius gracilis, sp. nov.
Tomopelta munda, sp. nov.
Clerada apicicornis, *Signoret.* (Very large.)
Pachygrontha longiceps, *Stål.* (Large ♀.)
Gonatas divergens, *Dist.*
Blissus leucopterus, *Say.* (One dwarf.)
Ptochiomerus dohrnii, *Guérin.*
Ozophora pallescens (*Dist.*).
—— sp. inc.
—— burmeisteri, *Guérin.*
Geocoris lividipennis, *Stål* (var.).
Pamera bilobata, *Say.*
—— vincta, *Say.*
Nysius providus, sp. nov. (vars.).
Cymus virescens, *Fab.*
Ninus notabilis, *Dist.*
Ptochiomera oblonga (*Stål*).
—— sp. inc. (soiled).
Bathydema socia, sp. nov.
Plinthisus sp. inc. (damaged).
Iscbnorhynchus championi, *Dist.*
Protacanthus decorus, sp. nov.
Dysdercus annuliger, *Uhler.*
Trigonotylus pulcher, *Reuter.*
Megacœlum rubrinerve, *Dist.*
Lygus prasinus, *Reuter.*
—— obtusus, sp. nov.
Fulvius albomaculatus, *Dist.*
Melinna minuta, sp. nov.
—— sp. inc.
Engytatus geniculatus, *Reuter.*
Collaria explicata, *Uhler.*
Phytocoris eximius, *Reuter.*
Mala decoloris, *Dist.* (damaged).
Cyrtocapsus caligineus, *Stål.*
Eccritotarsus atratus, *Dist.*
Pycnoderes quadrimaculatus, *Guérin.*
Cylloceps pellicia, *Uhler.*
Macrolophus separatus, *Uhler.*

[1] [Communicated by Dr. D. Sharp, F.R.S., on behalf of the W. India Islands Committee.

N.B.—The specimens dealt with in this memoir were collected by Mr. H. H. Smith, who was sent to the islands for the assistance of the Committee by F. D. Godman, Esq., F.R.S. Prof. Uhler is at present engaged in working out the larger collection formed by Mr. H. H. Smith and Mr. Summers in the neighbouring island of Grenada, and reserves remarks on the distribution of the species until the larger work is complete.—D. S.]

List of Species (continued).

Fundanius rubens, sp. nov.
Pœciloscytus obscurus, sp. nov.
Agalliastes simplex, *Uhler*.
Corythuca sp.? Allied to *C. gossypii*, Fab.
Typonotus planaris, *Uhler*, sp. nov.
Teleonemia sacchari, *Fab.*
Phymata annulata, *Uhler*.
Coriscus capsiformis, *Reuter*.
—— roripes, *Reuter*.
Saica recurvata, *Fab.*
Stenopoda culiciformis, *Fab.*
Narvesus carolinensis, *Stål*.
Henicocephalus flavicollis, *Reuter*.
Emesa angulata, *Uhler*, sp. nov.
Luteva gundlachii, *Guérin*.
Westermannia tenerrima, *Dohrn*.
—— sp.?, immature.
Cerascopus? larva.
Emesopsis nubilus, *Uhler*, sp. nov.
Salda humilis, *Say*.
—— humilis, var. Large size.
Pelogonus marginatus, *Latr.* Two varieties.
Limnometra marginata, *Guérin*.
Brachymetra albinervis, *Amyot*.
Microvelia pulchella, *Westw.* Unwinged.
—— capitata, *Guérin*. Dark coloured form.
—— marginata, *Uhler*. New sp.
Mesovelia bisignata, *Uhler*.
Rhagovelia obesa, *Uhler*.
—— elegans, sp. nov.
Zaitha anura, *H.-Schf.*
Anisops elegans, *Fieber*.
—— pallipes, *Fabr.* Immature.
Plea striola, *Fieber*.

There are also in the collection representatives of about 9 species of the family Anthocoridæ and of about 8 species of Ceratocombidæ.

B. *Descriptions of New Genera and Species.*

Fam. Coreidæ.

Sect. *Alydina*.

Darmistidus, gen. nov.

Form shorter than usual, almost flat above, the basal division of pronotum less sloping than usual. Head large and long, fully as long and a little wider than the pronotum, much wider than deep, gradually narrowing behind the eyes; the ocelli large, placed behind the line of the eyes and wide apart, but not far from the eyes; the eyes globular, moderately prominent laterally; the tylus narrow and gently sloping, enlarged at tip and a little bent down towards the base of rostrum. Antennæ slender, short, the basal joint thick, short, and not extending much beyond the tip of tylus; the second and third joints long, nearly equal, more slender than the others; the apical joint much thicker, scarcely as long as the third, contracted and a little bent at tip. Rostrum slender, reaching between the posterior coxæ; the bucculæ slender, waved in front and not enclosing the base of the first joint, the first joint shorter than the throat. Pronotum trapeziform, almost as long as wide, with the disk convex each side of the deep longitudinal groove, the apex contracted by a narrow collum, which is followed behind by a transverse curved series of slender callosities; the lateral margins bluntly carinate, oblique and feebly sinuated; the posterior margin is callous each side, and has lamellar lobes between the callosities and the humeral tubercle. Scutellum long and narrow, with the submargin carinate to near the acute tip. Tip of corium short, a little blunt, and not protracted backwards as in *Alydus* and next related genera; membrane long, charged with numerous, chiefly simple

and almost straight veins, the one next the outer apex forked. Posterior femora bent, stout, projecting about one-fourth of their length beyond the end of venter, armed beneath with series of short and longer teeth, which are set closer and arranged in a double series on the apical half.

DARMISTIDUS MACULATUS, sp. nov.

Pale testaceous, shaded and flecked with fuscous. Closely related to *Stachyocnemis*, but with a longer head and less robust figure, and destitute of the pilous covering of the head and pronotum. Head obsoletely punctate, minutely pubescent, with the longitudinal middle line slender and faintly defined; the crown and the surface at the ocelli marked with fuscous; throat pale testaceous; antennæ pale fulvous, the basal joint darker; rostrum piceous at tip and along the middle line. Pronotum either testaceous or pale fulvous, marked with dark brown dots, minutely, remotely pubescent, closely punctate and somewhat granulate, with the central line pale and the callosities dark brown; the humeral prominences and the posterior submargin usually brown, with the edge paler; the sternum pale and the pleural pieces darker and punctate. Legs sprinkled with reddish brown; the tibiæ pale testaceous, banded with a few dark brown, slender lines; tarsi with the last joint, nails, and tip of the long basal joint blackish. Scutellum remotely punctate, granulate, fuscous at base, and white on the apex and subapical carinate border. Hemelytra thin, translucent, greenish white, or pale fulvo-testaceous, with the veins interruptedly rufo-castaneous, and the thick end of the medial vein, apex of the clavus, and border at tips of corium piceous black; membrane whitish, with the veins minutely and faintly marked with rufous. Tergum with a broad black stripe along the middle, which grows narrower towards the tip; venter pale, smooth, minutely, transversely wrinkled, a little punctate on the middle and at base.

Length to tip of venter 6½–7 millim.; width of base of pronotum 1¾–2 millim.

Four specimens, one without a head.

Fam. BERYTIDÆ.

PROTACANTHUS, gen. nov.

Form of *Metacanthus*, Fieb., with the same tumidly convex head and conically produced clypeus. Eyes subspherical, set laterally and below the line of the vertex; ocelli placed far behind the eyes on a collum-like distinct lobe. Antennæ long and slender, the basal joint longest, not quite so long as the posterior femur, but longer than the two following joints united, minutely clavate at tip; the second and third joints subequal, still more slender; the apical joint shorter than the third, slender, fusiform. Rostrum slender, reaching to the posterior coxæ, with the basal joint not quite so long as the head. Pronotum short and stout, scarcely

wider anteriorly than the base of head, the anterior margin forming a collum, which is armed each side with an obliquely directed spine; posterior lobe wide and convex, carinate on the middle line, the posterior border deflexed, with the edge reflexed. Scutellum armed with a long, erect, curved spine. Corium long, impunctate, carried far along the border of the membrane, tender and translucent; veins of membrane few, long, curved, not connected by cross-veins. Legs long and slender, the middle and posterior femora a little thickened towards the tip. Abdomen long, a little shorter than the wing-covers, subcylindric, contracted at base, tapering from the middle to the tip.

PROTACANTHUS DECORUS, sp. nov.

Pale tawny yellow, with the head black and highly polished, the collum of the pronotum white, the spines pale testaceous, and the abdomen greenish testaceous, polished and impunctate. Antennæ yellowish, with the basal joints and tips of the following ones darker, the apical joint fuscous; rostrum pale yellow, darker at tip. Pronotum coarsely punctate, with the surface a little tumid behind on each side of the middle line; pleuræ also punctate. Legs pale honey-yellow, a little darker on tips of femora, the tibiæ annulated with black. Wing-covers whitish, translucent, the membrane hyaline.

Length to tip of wing-covers 4 millim.; width of pronotum $\frac{3}{4}$ millim.

Two specimens of this interesting species were collected by Mr. H. H. Smith on low swampy land, in an open place, near sea at the south end of the island, September 27.

Fam. LYGÆIDÆ.

TOMOPELTA, gen. nov.

Robust, oval, with both ends narrowed, opaque and pubescent above. Head short, set in as far as to the eyes, small, narrow, acutely triangular above; antennæ stout, about as long as the head, pronotum, and scutellum united, the basal joint longer than the head, the second joint a little longer than the third and subequal to the fourth, all conspicuously pubescent; throat flat; the rostrum reaching between the middle coxæ, basal joint as long as the throat. Pronotum distinctly bilobate, broad, the anterior lobe much wider than the head, longer than the posterior lobe, collar-like, one grade narrower and lower than the basal one, both arched, and with their lateral margin reflexed concurrently with the curve of each; prosternum with an uneven longitudinal ridge on each side of the middle line; the pleural pieces coarsely punctate, polished. The anterior femora fusiform, compressed. Scutellum longer than wide, abruptly acute at tip. Hemelytra coarsely punctate, pubescent, dull, the costal margins almost straight and parallel, a little sinuated on the middle; the costal area wide and grooved; membrane with the veins long and curved.

TOMOPELTA MUNDA, sp. nov.

Reddish chestnut-brown, pubescent, punctate all over the upper surface and beneath upon the pectus. Head dull blackish; antennæ fuscous, sometimes piceous or fulvous at base, the apical joint whitish excepting at base, tips of all the joints generally whitish; rostrum fulvous, sometimes darker at base and tip. Pronotum rufo-castaneous on the front lobe, which is also less distinctly punctate than the other and has the lateral margin almost straight; the posterior lobe is dark brown, coarsely punctate, and has four short, yellow, longitudinal stripes; the humeral angles prominent, a little rounded, the transverse line separating the lobes deep, indented at the outer ends, and with a minute pit in the middle. Scutellum reddish brown, marked with a yellowish Y-shaped figure, which is continued on the apical carina to the tip, the hollow space each side of tip dark brown. Beneath dark ferruginous, polished, especially on the venter. Legs pale yellow, hairy, punctate, a little brownish on the coxæ, base and tips of femora and tarsi. Hemelytra pale testaceous, minutely pubescent, remotely punctate with rufous or brown, middle of the costa with a small brown point; the inner apex of the corium has an irregular brown spot, which connects with the margin and runs out to a smaller spot on the extreme tip; membrane clouded with brown, the outer border thick and pale; venter fulvous, or soiled yellow, feebly polished, the sutures blackish.

Length to tip of abdomen about 2 millim.; width of base of pronotum $\frac{3}{4}$ millim.

Several specimens of this bright little insect were captured by Mr. H. H. Smith while they were flying at sunset, in the forest, in April, at an altitude of 1000 feet above the sea. This insect bears some resemblance to the genus *Drymus*, Fieb., but it is much narrower than *D. silvaticus*, Fab., of Europe.

BATHYDEMA, gen. nov.

Elliptical, body deep, thicker and wider than in *Peritrechus*, Fieb., minutely pubescent, dull, polished only on the venter. Head short, broad, inserted against the eyes, the eyes projecting a little beyond the side of the front of pronotum. Antennæ long, reaching almost to the tip of scutellum, the basal joint a little shorter than the head, the second longer, nearly equal to the third, the fourth much thicker, fusiform, about equal to the second in length; rostrum reaching between the anterior coxæ, not much thicker at base, the basal joint a little shorter than the throat. Pronotum trapeziform, thick, strongly sloping forwards, the lateral margin carinate through to the callous humeri; callosities prominent, long, placed obliquely; stricture separating the lobes conspicuous only on the sides; surface punctate, dull. Underside of head, propleura and mesopleura coarsely punctate. Anterior femora moderately thick. Scutellum small, simple, a little longer than wide, longitudinally callous at tip. Corium dull, wide, minutely

pubescent, with the veins thick and prominent, the costal margin almost straight, a little curved at tip; membrane wide, with a large, closed cell at the inner angle from which two veins run curving towards the tip.

BATHYDEMA SOCIA, sp. nov.

Robust, blackish piceous, yellowish pubescent. Head tinged with brown, not polished, punctate above and below; antennæ closely pubescent, pale fulvous or piceo-testaceous, with the basal joint darker above, and the thick apical joint fuscous, the apex of the second joint and base of the third sometimes with a narrow dark band; rostrum fulvo-testaceous, hairy, piceous at base and tip. Pronotum dull blackish, coarsely punctate, the anterior lobe interruptedly margined with yellow, the posterior lobe feebly sinuated behind, with a testaceous arc next the humeri and a dot of the same colour on the middle of the margin, the lateral margin pale castaneous behind; pleuræ dull piceous, punctate, pubescent, bordered with pale castaneous. Coxæ pale castaneous; legs yellow, tinged with fulvous. Scutellum dull fuscous, transversely convex at base, obsoletely punctate, pubescent, compressed and testaceous at tip. Corium and clavus testaceous, crossed in common by a dark brown broad band at tip, which includes two short yellow streaks and a dot; membrane brownish, with a pale dot at tip. Venter dull piceous.

Length to tip of membrane 2 millim.; width of base of pronotum $\frac{3}{4}$ millim.

This interesting little insect approaches nearer to *Peritrechus*, Fieb., than to any other genus with which I am acquainted. But the characters here given will, it seems to me, serve full well to separate it from that genus.

Four specimens were secured on the Soufrière volcano, in April, distributed in the moss, at altitudes of 2000 and 3000 feet above sea-level.

SPILÆROBIUS, gen. nov.

Form similar to that of *Heræus*, Stål, but differs most conspicuously in having the anterior lobe of pronotum globose and as wide as the very short posterior lobe. The head is conico-ovoid, acute at tip, the tylus projecting prominently in front of the clypeus, with the two adjoining lobes of the cheeks short and feebly prominent; eyes placed on or below the line of the vertex; basal joint of rostrum thick and shorter than the throat. Antennæ moderately long, gradually thickening towards the tip, the basal joint much shorter than the head, the third joint a little shorter than the second, the apical joint longest and much thicker than the third; the bucculæ short and restricted to the tip. Collum of the pronotum wide below, narrow above; the anterior lobe of the pronotum fully as wide as the very short, transverse posterior lobe, separated by a deep stricture, coarsely punctate, with the posterior margin sinuated and the humeral angles callous. Anterior femora very thick, fusiform,

armed beneath with about four long spines, which have shorter spines between them throughout the greater part of the length. Scutellum long, compressed and acute at tip. Wing-covers narrow, the costal margin almost straight, a little curved at tip; veins of the corium distinctly prominent. Connexivum strongly elevated along the margin of the abdomen.

Sphærobius gracilis, sp. nov.

Coal-black, polished beneath and on the anterior lobe of the pronotum, invested with erect hairs on most parts of the surface, both above and below. Head dull black, set with remote bristly hairs, remotely punctate, scabrous especially on the clypeus, the throat coarsely punctate; antennæ fulvo-piceous, with the apical joint and tips of the others fuscous; rostrum piceous, paler on the middle, reaching between the anterior coxæ. Pronotum jet-black, with the posterior lobe rufo-piceous, coarsely and evenly punctate, pubescent, the anterior lobe set with bristly hairs, obsoletely punctate in remote lines, a few series of more distinct punctures upon the lower part of the sides. Legs piceous black, paler on the tibiæ, the tarsi chiefly testaceous, the anterior tibia of the left side (possibly of both sides) armed with a long curved spine. Scutellum pubescent, coarsely, remotely punctate, paler at tip. Corium whitish testaceous, coarsely punctate with brown in longitudinal series, the posterior half blackish brown, with a subquadrate pale spot exteriorly before the tip, the base also brown; membrane short, incomplete, blackish, pale at base. Abdomen black, polished.

Length to tip of venter 4½ millim.; width of base of pronotum 1 millim.

One specimen only was captured, on the leeward side of the island. As it is closely glued to the slip of card the underside and femora of the right side cannot be studied.

The presence of the spur on the anterior femur adds a new element of structure to this remarkable insect. It bears much resemblance to an ant, and is much narrower than the other species described as *Heræus insignis*, Uhler.

Fam. Capsidæ.

Cylloceps, gen. nov.

Long elliptical, blunt at both extremities, almost flat above, polished, with the hemelytra thin, pellucid. Head very short, vertical, the sides enclosed by the vertical eyes; tylus very short, projecting a little before the line of the eyes; vertex transverse, cylindrico-convex on the middle, scarcely higher than the low-placed upper line of the eyes; bucculæ wide apart, narrow; rostrum slender, the basal joint longer than the head; gula constricted; lobe behind the eye in contact with the pronotum. Pronotum transverse, trapezoidal, feebly sloping, almost flat, destitute of a collum, the sides oblique, bordered with a linear callous margin

from the humeri to near the bluntly rounded anterior angle; the surface polished, with the callosities large, smooth, almost contiguous, the suture behind them faintly defined, the humeri acutely tubercular, the anterior margin slightly excavated across to the middle of the eyes, and the posterior margin feebly sinuated. Scutellum of medium size, about as wide as long, prominently convex. Legs of medium size, the posterior femora long, curved, compressed; unguiculi long, slender, widely spreading apart. Hemelytra complete, much longer than the abdomen, bluntly rounded at tip, almost parallel-sided, the costal margin only a little curved, abruptly reflexed, the discoidal vein well defined, and the membrane almost as long as the corium. Abdomen ample, not contracted at base, blunt at tip in the female, but tapering towards tip in the male.

CYLLOCEPS PELLICIA, sp. nov.

Pale testaceous, long elliptical, polished, minutely pubescent. Head yellow, black along the middle line, including the tylus, sometimes with a black band between the lower line of the eyes; bucculæ blackish; rostrum yellowish, piceous at tip, reaching behind the middle coxæ. Antennæ long, gradually decreasing towards the tip, the basal and second joints stout, the second much the longest, obscure yellowish, the third a little shorter than the second, and the fourth still shorter, the basal one shortest, a little longer than the head, black excepting at base and tip. Pronotum moderately polished, dull yellow, obscured by brown posteriorly and towards the sides, the surface a little scabrous, transversely wrinkled, remotely punctate, minutely pubescent, the sides beneath more or less infuscated and a little scabrous; sternal segments polished, mostly yellow, those of the mesosternum more or less dusky. Coxæ and legs pale yellow, the femora usually a little darker at base and with the immediate tip piceous, the nails and tip of tarsi piceous. Scutellum dark brown, obsoletely carinate on the middle line, polished, not distinctly punctate. Hemelytra pellicular, translucent, pale testaceous, obsoletely fuscous on the inner border of the clavus and corium, the coarse bounding vein at basal angle of membrane piceous, the vein on middle of corium is also dusky in some specimens; veins of membrane usually a little brownish. Venter yellow, more or less dusky on the middle, with the sides tinged with rufous or orange and the ovipositor piceous.

Length to end of venter 2½ millim., to tip of membrane 3 millim.; width of base of pronotum barely 1 millim.

Several specimens of both sexes, collected by Dr. Gundlach in Cuba, were submitted to me for examination, and others are in the collection from the island of St. Vincent, which were captured by Mr. Herbert H. Smith in the month of May. I have also seen a specimen from Southern Florida and others from the island of San Domingo.

Not having specimens for dissection, I have been unable to ascertain a few points necessary to establish the precise relations

of this genus. It seems to be closely related to *Agalliastes*, but it is without the saltatorial hind femora, and it differs from that genus in the details given above. In a few specimens the pronotum has simply a narrow black band across the base.

Genus Melinna, Uhler.

Melinna minuta, sp. nov.

Narrower than usual, with the sides parallel, the surface highly polished, dull dark horn-brown, relieved with pale yellowish testaceous. Head particularly convex, very highly polished, with a few obsolete punctures on the crown, dull pale yellowish, with the middle broadly piceous and the tylus dusky; the occiput contracted, narrower than the collum of the pronotum, but the space between the eyes wider than the front of the pronotum; eyes brown, large, most prominent laterally, almost spherical. Antennæ moderately stout, horn-brown, the second joint pale at base, reaching from the front of eye to basal angle of pronotum, becoming gradually a little thicker towards the outer end, the third joint abruptly thinner and with the fourth continuing of the same thickness throughout; both of these joints pale yellow, hairy; rostrum slender, yellowish white, reaching behind the anterior coxæ. Pronotum transverse, moderately convex, obsoletely punctate, with the lateral margins very oblique, a little sinuated, with the edge moderately acute, but not carinated, and the humeral angles prominent, the posterior margin hardly sinuated, the border a little rolled and turned down. Scutellum minutely, obsoletely punctate, concolorous with the thorax and hemelytra, and polished like them, convex, pinched at the tip. Legs, coxæ, and ovipositor ivory-white. Hemelytra polished like the pronotum, minutely golden pubescent, minutely obsoletely punctate; the costal border straight, honey-yellow; the incisure of the cuneus and inner edge of the same pale; membrane a little dusky, darker at base. Venter chestnut-brown, polished, a little paler at tip.

Length to tip of venter $1\frac{3}{4}$–2 millim.; width of pronotum $\frac{7}{8}$ of a millim.

Similar to *M. elongata*, Uhl., but with a nick behind the eyes. Two specimens are present in the collection and a fragment of a third adheres to the card of another pin. Two specimens were obtained in the wooded country at an altitude of 1000 feet above sea-level, and a third was beaten from bushes in the Petit Bordelle Valley at an altitude of 1600 feet above the sea.

Another small species, coarsely punctate, apparently belonging to this same genus, was obtained, but the only specimen present is too imperfect for description.

Genus Lygus, auctor.

Lygus obtusus, sp. nov.

Soiled pale green, polished, minutely pubescent, with the head short and blunt as seen from above and closely pressed against the

pronotum, with the eyes large and prominent outwards; the face triangular, convex on middle, highly polished, obsoletely punctate, with a punctate impressed line on the middle of the vertex; tylus prominent, a little discoloured, with the cheeks each side callously prominent; antennæ moderately long, the second joint rod-shaped, as long as the width of the pronotum, third and fourth more slender, tinged with fuscous; rostrum pale greenish, reaching upon the middle coxæ. Pronotum short, strongly convex, minutely pubescent, highly polished, unevenly punctate in wavy transverse series, the posterior margin feebly sinuated, the lateral part of this margin widely rounded, with the edge acute and pale, terminating exteriorly in an acute tubercle; pleura with a dark stripe extending to the end of the posterior segment; legs pale green, a little obscured at end of femora, the posterior femora with the common oblique pair of brown bands near the tip; tibial spine fuscous. Beneath whitish. Hemelytra closely pale pubescent, unevenly punctate, with the disk infuscated, the outer border broadly pale and the cuneus equally pale, the apical extremity of the inner border of corium pale piceous, the clavus coarsely punctate like the convex scutellum; the membrane brown, especially at base.

Length to tip of venter 3–3¼ millim.; width of pronotum 1½ millim.

Two specimens, a male and a female, were obtained on the leeward side of the island.

The scutellum may be faintly pale along the middle line and a little obscured each side near the tip.

Genus Fundanius, Dist.

Fundanius rubens, sp. nov.

Cinnabar-rufous, tinged with orange. Form normal, the upper surface roughly punctate, excepting the head. The head highly polished, less distinctly punctate, with the face vertical, deeply sunken and grooved on the middle; the eyes prominent, dark brown. Antennæ brownish black, stout, stouter in the male; third joint short, abruptly slender; the fourth a little shorter and more slender than the third; the second joint rod-shaped, not tapering, a little shorter than the width of the pronotum. Rostrum slender, yellow, reaching between the middle coxæ. Pronotum strongly, broadly constricted behind the hood of anterior lobe, most coarsely punctate on the posterior lobe, and the disk occupied behind by a large trapezoidal black spot which touches the posterior margin, anterior part of the middle line carinated; propleura and sternum bright orange, the meso- and metapleuræ soiled orange or pale brown, but brighter on the sternum. Legs and coxæ pale dull testaceous, soiled brownish on the apices of femora and tibiæ, the tarsi and nails piceous. Scutellum blackish brown, coarsely punctate, deeply sunken and grooved on the middle line, the margin prominently elevated, callous, smooth. Hemelytra black along the entire length including the membrane, the outer border broadly

orange, and this colour covers the entire cuneus, the outer border and cuneus less coarsely punctate than the clavus. Venter blackish, with the disk basally dull orange.

Length to end of venter 2¾–3 millim., to tip of membrane 4–4½ millim.; width of pronotum 1¼–1½ millim.

Three mature specimens, a male and two females, and two larvæ were secured. These were met with on both sides of the island, and the larvæ were obtained at the roots of grass on the marsh 500 feet above the level of the sea.

This genus belongs to the division *Clivinemaria* of Reuter, and this species, together with the two other hooded species of Mr. Distant, may eventually be found to belong to the genus *Clivinema*, Reuter. In this genus there is lack of uniformity in the proportions of the antennæ, not only in the two sexes, but also among individuals of the same species.

Genus Pœciloscytus, Fieber.

Pœciloscytus obscurus, sp. nov.

Closely related to *P. basalis*, Reuter. Dark chestnut-brown, oblong-ovate, spread with close fine golden pubescence; female broader than the male. Head long, acutely triangular, dull, not distinctly punctate, polished when denuded; face convex, surface around the eyes, a slender streak on the middle, and the cheeks each side of tylus more or less yellowish; the tylus, bucculæ, and base, tip, and middle of rostrum dark brown, the rostrum mostly yellowish and reaching behind the posterior coxæ; the transverse carina at base of head prominent, piceous, polished. Antennæ of medium thickness, as long as from front of eye to tip of cuneus; the joints either dark brown or pale with brown ends, excepting the apical ones which are pale fuscous and nearly setaceous; the second joint is about as long as the base of pronotum. The pronotum is moderately convex, obsoletely punctate, and covered with the same prostrate golden pubescence as the head, scutellum, and hemelytra; the collum is generally testaceous or white, and back of its middle is a short yellow double spot or band, against each anterior angle there is usually a velvet-black round spot, the posterior margin is a little sinuated and usually pale; the sternum, posterior border of pleural segments, and coxæ are usually pale testaceous. Legs dark brown in full-coloured specimens, but pale yellowish brown in others, paler on the tibiæ, and having the posterior femora marked near the tip by the usual two darker bands. Scutellum moderately convex, obsoletely wrinkled and punctate, bordered with testaceous near the tip. Corium, clavus, and cuneus finely but distinctly punctate, the embolium and costa with a testaceous spot at base, the fracture and tip of cuneus and vein of membrane dull testaceous; the membrane dark fuliginous. Venter black-piceous or sometimes pale chestnut-brown on the middle, spread with silvery pubescence and with the edge of the genital valves testaceous.

Length to end of venter 2½ millim., to tip of membrane 2¾–3 millim.; width of base of pronotum ⅞–1¼ millim.

Numerous specimens, including some of both sexes, were collected in various parts of the island. This species is also common in Cuba, and I have swept specimens of it from weeds in the department of the Grand Anse, Hayti. Other specimens have also been seen by me, which were collected in Southern Florida, Mexico, Jamaica, and Brazil. This form will illustrate the variation which occurs in the joints of the antennæ, some specimens having the antennæ tapering, while in others the apical joints are abruptly setaceous.

Fam. Tingitidæ.

Typonotus, gen. nov.

Form similar to *Gargaphia*, Stål, but lacking the transverse carina at the end of the mesosternum. The pronotal hood protracted long in front of the head, acutely compressed at tip and curved downwards, opaque, carinate on the middle line, with two longitudinal series of sunken areoles, followed beneath at base by a shorter series of smaller ones, with the lower border strongly reflexed. Carina of the mesonotum high, indistinctly areolate, arched and sinuated. Wing-covers almost flat, subquadrangular, narrowing posteriorly, the costal area ampliated about the middle, with the border strongly reflexed; the basal division of the area is occupied by two imperfect series of areoles, which are followed towards the tip by a single series of much larger ones. Sternal carinæ high, set wide apart, and curving on the metasternum. Throat enclosed by an elevated border of the prostethium. The antennæ slender, of medium length, with the apical joint short, clavate. Pronotal lobes subtriangular, widely extended, protracted in a narrow lobe anteriorly, reflexed, set with curving series of nearly circular, large areoles. Legs slender.

Typonotus planaris, sp. nov.

Oblong, milk-white, opaque, contracted at the base of wing-covers and narrowing obliquely behind the middle, marked with brown across the sunken middle of the pronotum and in the grooves each side of the hood. Hood long and narrow, acutely compressed at tip. Scutellum with an obscure spot each side. Veins of the wing-covers a little dusky in patches, sometimes tinged with yellow, the discoidal area with a dusky spot at base and tip, the costal area usually with a brown crescent near the base and one or two spots near the tip; veins of the membrane marked with fuscous so as to form a broad, double, transverse loop next the tip: this dark area encloses cells of a larger size and more transparent colour than those of the corium. Underside black, with the bucculæ, margins of the pleural pieces, and sternal carinæ whitish. Legs pale fulvous, darker at the ends of femora, tibiæ, and tarsi. Antennæ pale, the clavate apical joint dusky.

Length to end of abdomen 1–$\frac{1}{8}$ millim., to tip of wing-covers 3 millim.; width across lobes of pronotum 2 millim.

The less mature individuals of this species are paler and almost translucent in the meshes of the wing-covers, while the fully mature ones are tinged with yellow and more opaque.

About one dozen specimens were collected by Mr. Herbert H. Smith.

Genus Corythuca, Stål.

Examples of a species of this genus, approaching *C. gossypii*, Fabr., were taken on the island by Mr. Smith, but the few specimens are either immature or not in condition for accurate identification.

Fam. Emesidæ.

Genus Emesa, Fabr.

Emesa angulata, sp. nov.

Body and members more robust than in *E. longipes*, De G., and the other normal species. Obscure fulvo-testaceous, unpolished, with the sides of the head and thorax broadly blackish piceous. Head stout and deep, remotely punctate in patches, obsoletely scabrous, minutely pubescent, the division behind the stricture longer than the one before it, base of tylus armed with a short curved spur. Rostrum reaching the anterior coxæ, the basal joint stout; the second a little longer and thicker, tapering towards the tip; the third pale testaceous, tapering at base, swollen, growing quite slender, longer than the first and second united. Antennæ slender, filiform, of medium length, fuscous, pale at base, and sometimes with an obscure band on this paler portion, the basal joint equal to the thorax in length, the second much shorter. Middle and posterior legs filiform; the tibiæ more slender than the femora, black at base and banded with black, in four spots upon the femora and three upon the tibiæ; anterior femora thick, subcylindric, compressed, obscurely banded with fuscous, set with two sizes of teeth from before the middle to the tip, the inner tooth much longer than the others; the tibiæ fuscous with a pale band, the tarsal nail not quite reaching to the inner tooth. Pronotum obsoletely scabrous and almost flat above, faintly marked with a longitudinal impressed line, the anterior half a little swollen, back of this the lobe is a little contracted, while the posterior lobe is quite small, and elevated into two transverse toothed callosities, anterior angles tubercular. Mesonotum taperingly contracted from the middle forwards, so as to be much narrower than the pronotum, while the basal portion swells to nearly the width of the pronotum, the middle line has a slender carina which runs back through the grooved metanotum; the metanotum is much shorter than the mesonotum and has carinated sides. The underside, including the venter, is smooth, somewhat glossy on the sternum, with the venter dusky and dull. The abdomen is thick and gradually widens posteriorly, the posterior end being obliquely truncated in the female, but

rounded and with a curved spur above in the male; the outer angle of the dorsal segments is more or less toothed.

Length to end of abdomen 18–19 millim.; width of front of pronotum 1 millim.; width of last segment of abdomen $1\frac{1}{4}$–$1\frac{1}{2}$ millim.

Several specimens of both sexes were secured at various places on the island. Only unwinged ones were found, and three or four of these are in the younger stages. These nymphs are essentially like the adult and differ more in size than in the elements of structure. The form of pronotum and abdomen with the accompanying teeth is nearly the same as in the full-grown specimens. One specimen was found on the leeward side of the island, in September, at an altitude of 2000 feet, and others were captured under logs on the Richmond estate, leeward, in an open valley near sea-level, on October 31. In my collection there are specimens from the vicinity of Panama.

EMESOPSIS, gen. nov.

Form similar to that of *Ploiaria*, Scop., agreeing therewith especially in the form of the head, but differing in the venation of the hemelytra. Head wide and short, tumidly convex behind, the transverse stricture crossing between the eyes; the throat unarmed. Rostrum reaching between the anterior coxæ; the basal joint stout, extending behind the line of the eyes; the second shorter, tumid; the third slender throughout, shorter than the basal one. Antennæ almost setaceous, the basal joint a little stouter, about as long as the head and pronotum united; the second and third shorter, subequal. The eyes subglobular, placed below the level of the vertex. Anterior tibiæ and tarsi together scarcely shorter than the femora, the femora apparently armed with fine spines throughout nearly the entire length. Pronotum short, the posterior lobe more than twice as long as the anterior one, tumidly convex behind; the anterior lobe very short, elevated into a callosity each side. Scutellum small, distinct, conical at base, constricted behind, the narrowed portion evenly cylindrical to the tip. Hemelytra membranous throughout, gradually widening towards the tip, the costal margin straight to beyond the middle; veins of the corium sharply distinct, the transverse ones few, crossing at nearly right angles, the cells growing larger posteriorly, the apex with a triangular narrow cell at both the outer and inner angle; cells of the membrane large, the basal one longest, ending in a protracted narrow loop, which sends off a vein to the tip. Abdomen moderately flat, widened towards the middle.

EMESOPSIS NUBILUS, sp. nov.

Pale fulvo-testaceous, elongate, but not linear, smooth above, pilose over most of the surface. Head obsoletely, minutely punctate, the transverse impressed line and a small spot on the middle brown. Antennæ setaceous, the last joint infuscated; eyes fuscous. Legs pilose, the intermediate and posterior femora

banded with pale fuscous, the anterior legs a little clouded with fuscous. Pronotum smooth, obsoletely, minutely punctate on the posterior lobe. Hemelytra longer than the abdomen, the veins and a series of spots at the apex of the membrane fuscous. Outer margin of the abdomen piceous.

Length to end of abdomen 4 millim., to tip of membrane $4\frac{3}{4}$ millim.; width of base of pronotum $\frac{3}{4}$ millim.

One specimen is in the collection from this island.

This species seems to be not rare in Cuba. Several specimens have been sent to me from that island by Dr. Gundlach, and others are in his collection.

Fam. VELIIDÆ.

Genus MICROVELIA, Westw.

MICROVELIA MARGINATA, sp. nov.

Dull black, nearly wedge-shaped, minutely pubescent, and obsoletely punctate, with the breast orange and the pronotum bordered with orange. Head rather blunt, convex between the eyes, a little compressed and produced at the end of the clypeus, the underside pale testaceous. Antennæ stout, closely hairy, black; third and fourth joints longer than the others, the fourth longest, acutely tapering at tip; the basal joint thicker than the others, much longer than the second, pale beneath. Rostrum stout and swollen at base, reaching behind the anterior coxæ, pale testaceous, piceous at tip. Pronotum broad, moderately convex, with the humeral angles bluntly rounded, and not prominent as in *M. capitata*, Guér. Pectus broadly yellow, dusky on the middle and posteriorly. Coxæ and legs pale testaceous; the posterior legs dusky above, and fulvous on the middle of the tibiæ. Scutellum dusky, mostly concealed by the pronotum. Wing-covers black, bluntly rounded at tip. Abdomen black above, tinged with lead-colour and a little sericeous beneath, the lateral margins broadly fulvous; the venter has sometimes a row of fulvous dots ach side.

Length to tip of abdomen $1\frac{3}{4}$–2 millim., to end of wing-covers $2\frac{1}{4}$ millim.; width of pronotum $\frac{3}{4}$ millim.

Several specimens, both winged and unwinged, were collected by Mr. Smith in the pools of cool water at various localities on the island.

3. Observations on the Refraction and Vision of the Seal's Eye. By G. LINDSAY JOHNSON, M.D., F.Z.S.

[Received November 21, 1893.]

In the course of my investigations on the vision of the Mammalia, I was particularly struck with certain peculiarities in the eye of *Phoca vitulina*, the Scotch Seal, so frequently met with off our northern coasts. The eye, as everyone must have observed, is

particularly large for the size of the animal, being slightly larger than our own. The sclerotic is chalky white, almost entirely free from blood-vessels, and the cornea very large, round, and of great convexity. This latter point is very remarkable for a reason which I will point to later on.

The iris is of a rich yellow-brown colour and contracts rapidly to light. The eye is capable of being partly retracted into the orbit and is protected by a well-developed membrana nictitans. I have repeatedly amused myself by making experiments to ascertain how far the m. nictitans can be drawn over the eye of the Seal, but I could never get it to extend over more than a third of the distance across the cornea of its own accord, although I have tried, by pinching the conjunctiva or by placing hairs and other foreign bodies on the cornea, to stimulate it to further action; but this always failed to have any effect, as, contrary to what we find in most text-books, the membrana nictitans is never used for brushing away foreign bodies as in birds[1]. I hope in a future paper to discuss the action and purpose of the membrana nictitans in various families of the Mammalia, but space compels me to confine myself in this paper to the apparatus more immediately concerned in vision.

Before going further I will, with your permission, pass a few remarks on the nature of vision in ourselves. The human eye, as we are all aware, is a nearly spherical expansion of the optic nerve and its connective-tissue coverings. The posterior half is lined with the light-sensitive retina, while the anterior portion, together with the contents of the globe, form a dioptric apparatus for the convergence of rays on its surface. This dioptric system is made up of four distinct media: the cornea, the aqueous humour, the lens, and the vitreous body. This optical system consists then of the transparent media and the refracting surfaces which separate them from the air and from each other. Now if we examine their refractive indices, we shall find that, excepting the lens, all the media have the same refractive index, viz. 1·3365. But this is the refractive index of sea-water, so that if we plunge our heads under the waves our dioptric apparatus becomes at once simplified down to a single lens in front of a sensitive surface (the retina). We shall thus, under water, be quite unable to see anything around us distinctly, and that for a very simple reason. We know that in a state of rest parallel rays come to a focus on the retina of a normal eye. Now in a state of rest the crystalline lens has in aqueous humour (or, what amounts to the same thing, in sea-water) a mean focal distance of 50·61 mm.=1·994 inches. Since the distance between the optical centre of the lens and the retina amounts to 15·62 mm., it is clear the image for parallel rays must lie 50·61 mm.−15·6 mm., or 35 mm., behind the retina; in other words, we need the addition of a convex lens of something

[1] Exceptions to this rule occur in the Ungulata and certain other grass-feeding animals.

like $1\frac{1}{2}$ in. focus in air to see with under water. But this cannot be made of glass, since the latter has nearly the same refractive index as water. To meet this difficulty Dr. Dudgeon some years ago had a pair of spectacles made consisting of portions of two hemispheres of plain glass with parallel surfaces, mounted in a brass ring with their convex surfaces nearly touching one another. I have brought the original pair to show you. In air they produce no effect, neither magnifying nor reducing; but in water the biconcave air-lens, for such it is, becomes a biconvex one, the convex surfaces of the water in this case forming the lens. Dr. Dudgeon, who has the credit of entirely solving this problem, made a number of sketches under water, one of which I have reproduced. Were it not for the distortion and astigmatism everything could be seen; even the date on a coin can be made out.

Fig. 1.

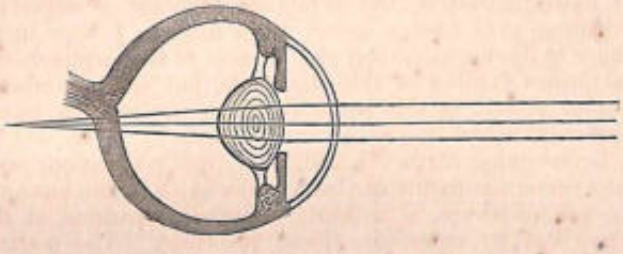
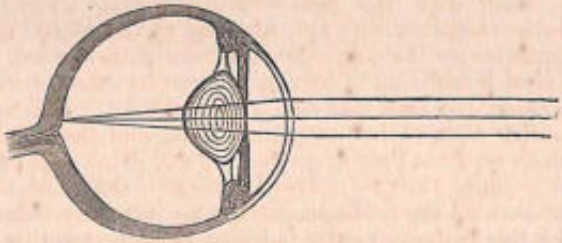


Fig. 2.



Transverse section of the Seal's eye; natural size. (Diagrammatic.)

Fig. 1 shows the path of light-rays in the eye when uncorrected under water. Fig. 2 shows the path of rays when the eye is corrected for air.

In the Seal's case the problem is rather more complicated, for the Seal has to see under four conditions. He has to see out of water when out of water, in water when under water, out of water when under the water, and in water when out of the water. The first two conditions alone need be considered, as the two latter follow by necessity.

Now the Seal's eye is very much the same shape as our own, excepting that the cornea is larger and more convex and the anterior chamber very deep. This convexity of the cornea is very curious, as one would expect to find it nearly flat as in the fish—since the flatter the cornea and the nearer the lens to it, the less

would be the thickness of the media to be neutralized by the water. In most fishes' eyes (as we are aware) the lens almost touches the cornea and is nearly spherical.

On taking the refraction of the living Seal's eye out of water, I was surprised to find that he possessed a myopia of 4 diopters or 10 in. in the vertical meridian and 13 diopters or about 3 in. in the horizontal,—the difference between these two curvatures producing an astigmatism of 9 D, an amount altogether incompatible with even useful sight and rarely if ever met with among human beings even in disease.

On applying a solution of atropine to the eye, I had an opportunity of ascertaining how the iris overcame this error. It is well known to oculists that high grades of astigmatism may be almost entirely neutralized by an opaque diaphragm in the centre of which is a narrow stenopaic slit placed at right angles to the error of curvature.

I noticed the Seal's pupil contracted up to this shape, varying from a vertical slit 13 mm. long by 3 mm. broad, to one 3½ mm.

Fig. 3. Fig. 4. Fig. 5.



The Seal's iris.

Fig. 3 shows the Seal's iris with its narrow, vertical, slit-like pupil as seen out of water.
Fig. 4 shows the pupil in a state of extreme contraction.
Fig. 5 shows the pupil widely dilated by atropine and when under water.

long and barely 1 mm. broad. By careful estimation of the refraction in the two opposite meridians by the direct method with the ophthalmoscope and by retinoscopy, I ascertained both eyes to have the same refraction in the two meridians and the meridian of greater myopia to be the horizontal, which could be corrected by a stenopaic slit in the vertical meridian.

How does this extraordinary amount of astigmatism help the animal to see? The difference between vision in air and in water, viz. 26 D or 27 D, may be corrected to a large extent by powerful accommodation, and the 13 D of myopia may correct half the amount of error in the horizontal meridian. On the other hand, the vertical meridian will only be corrected to the extent of 4 D, which is only a sixth or a seventh of the total.

Moreover, I find that the Seal's iris dilates to the full in water

and closes more or less in air, because the correction for the astigmatism is evidently made for air and not for water. Now our iris dilates when the accommodation is relaxed, and contracts when it is called into play; and if in the Seal the accommodating mechanism be the same as ours, the above-mentioned changes would obviously only make matters worse.

But here again the question is beset with difficulties, for this myopia could only be of service if it were due to the lens, since any curvatures of the cornea would be neutralized by the water.

At present my observations go to prove that the iris is to some extent at least under the control of the animal's will, since in one Seal, at any rate, I observed the pupil moving out of all proportion to the accommodation, while, on the other hand, I induced accommodation by approaching a piece of fish without any alteration in the pupil.

I hope in a future paper to be able to give some explanation for this extraordinary amount of astigmatism, and although I have a theory I would rather reserve any further attempts at an explanation until I have verified all the facts which bear on the question and examined all objections which can be urged against it.

4. On some Specimens of Mammals from Lake Mweru, British Central Africa, transmitted by Vice-Consul Alfred Sharpe. By P. L. Sclater, M.A., Ph.D., F.R.S., Secretary to the Society.

[Received November 16, 1893.]

Mr. Alfred Sharpe, H.B.M. Vice-Consul in Southern Nyasaland, has kindly sent me some specimens of the larger Mammals which he obtained during his recent journey from the north end of Lake Nyasa to Lake Mweru and the Luapula[1], together with a number of flat native skins procured from the natives at Mweru. These I have now the pleasure of exhibiting.

In a letter written from Blantyre (28th March, 1893) after his return, Mr. Sharpe gives the following interesting account of the animals met with on his route:—

"On the road from Nyasa to Tanganyika almost no game is seen until the Saisi is reached [this river, rising in the Mambwe Country, flows N.E. and E. to Lake Hikwa]. There, for the first time on this route from the sea to Tanganyika, one finds the *Cobus vardoni*, also the Impala (*Æpyceros melampus*), Roan Antelope (*Hippotragus equinus*), Lichtenstein's Hartebeest (*Bubalis lichtensteini*), Eland, Zebra, &c. After leaving the Saisi flats little game is seen on the road thence to the south end of Tanganyika.

"I doubt if game can, anywhere in Central Africa, be more

[1] See Mr. Sharpe's paper on this subject, Geogr. Journ. i. p. 524 (1893), and the accompanying map.

plentiful than in the Mweru and Luapula Countries, though there may be districts which have a greater variety. *Cobus vardoni* and *C. leche* run in enormous herds. Buffaloes and Zebras are also there in vast quantities. The two first-named Antelopes are frequently found together, are much alike in appearance, and are both known by the natives as '*Nswala*.' (The Impala is also called '*Nswala*' by them.) The horns of the Letchwé have a much larger spread than those of Vardon's Antelope, but at a distance it is difficult to distinguish between the two. The Letchwé has a little black stripe on the fore legs which is not found in Vardon's Antelope. A noticeable feature about the male Letchwé is that when he runs he puts his head down, laying back the horns. Vardon's Antelope does not do this.

"Near the north-east end of Lake Mweru I met with a species of Waterbuck quite different from those inhabiting Nyasaland. The whole skin is of a darker—"bluer"—colour. The white marks on the buttocks are not so distinct, and the beast is somewhat smaller in size than that Antelope. I forward you, through Mr. H. H. Johnston, a skin of one of these Mweru Waterbucks, which was shot by Mr. John Kydd (who accompanied me on my journey). Mr. Crawshay has obtained several of them. I also forward you skins and horns of the *Cobus vardoni* and *C. leche*; also the horns of male and female Roan Antelope, and a quantity of skins of small mammals, monkeys, cats, &c., all from Mweru.

"One skin which I send is of a diminutive little Antelope from Mweru. I never saw it alive myself, but bought the skin from a native, who told me that it has very small, short, straight horns. My 'boys' from Nyasaland do not know it.

"The 'Situtunga'[1] frequents the Great Mweru Marsh, and many of the swamps north, east, and south of Mweru Lake. Mr. Crawshay saw one, and obtained the horns of two, but neither he nor I succeeded in shooting a specimen; they live almost in the water.

"The African Cattle-plague has created terrible havoc among the wild game on the Lower Luapula (near its entrance into Lake Mweru); also, to a less degree, in Itawa, Ulungu, and Unyamwanga. All the dying beasts that I saw had a more or less copious discharge from the nose. Buffalo, Vardon's Antelope, and the Letchwé seem to have suffered most.

"Around Lake Mweru, both the 'Njiri' (Wart-hog) and the 'Guruvi' (which, if I am not mistaken, is one of the River-hogs), are very plentiful. I send you heads of each, with the tusks in; you will see how different they are.

"On the southern shores of Lake Mweru Lions are more plentiful than I have seen them elsewhere in British Central Africa, and I had some lively times with some of them. I am able to confirm the fact that Lions do occasionally climb trees. I saw one, on one occasion, high up in a large bushy tree, he was more than fifteen feet from the ground. On seeing us, he came down to the ground,

[1] *Tragelaphus spekii*, I believe.—P. L. S.

crashing through the branches, having (I think) lost his hold and fallen. I shot him as he bounded off. He was a male, three-quarters grown. The trunk of the tree was rather sloping and not difficult to climb.

"The extensive marshes through which the Luapula runs immediately before entering the south end of Mweru are the refuge of many Elephants, and this is one of the few spots in the southern portion of Equatorial Africa where they are still plentiful. The cattle-plague has not touched them.

"Rhinoceroses (of the Black species) are scarce throughout the Mweru and Luapula Countries. I saw none on my last journey, and only once came across their spoor. Buffalo and Burchell's Zebra are to be seen in vast herds in the country east of Mweru Lake, on the borders of the Great Mweru Swamp. I have seen them in herds of many hundreds. Throughout Itawa, Zebras are constantly met with.

"Buffaloes are numerous on the banks of the Luapula; Roan Antelopes throughout the country from Tanganyika west and south. Reedbucks and Bushbucks are found everywhere. Elands, Sable Antelopes, and Hartebeests are also seen throughout the countries that I have mentioned, but are not so plentiful."

I now proceed to give a list of the species represented in Mr. Sharpe's collection, so far as I can distinguish them. To make the list of the Mammals of this district as complete as possible I have added the names of some species represented in a series of skins and horns from Lake Mweru transmitted home by Mr. R. Crawshay (who was lately Resident at the Station called Rhodesia, at the N.E. corner of Lake Mweru) along with Mr. Johnston's collections.

1. Cercopithecus opisthostictus, sp. nov.

Two flat skins, which appear to have been used as dresses. So far as I can tell, they belong to a *Cercopithecus* allied to *C. samango* (see above, p. 251), but distinguished by the blackish under surface, the black upper back, and the two small rufous patches on each side of the tail. The species may be diagnosed as follows:—

Supra pallide cinereo et nigro confertim annellatus, capite obscuriore; cervice postica, humeris cum manibus et pedibus extus et cauda (nisi ad basin) nigris; plaga parva ad latus dorsi postici utrinque castanea: subtus nigrescens. Long. corp. 24 *poll.*, *caudæ* 25 *poll.*

Hab. Africa Centr. Britann. ad Lacum Mweru.

2. Felis serval, Erxl.; Elliot, Mon. Fel. pl. xxvi.

One flat skin, apparently of this Cat, or of a nearly allied species.

3. Felis caffra, Desm.; Elliot, Mon. pl. xxxi.

One flat skin of a Cat of this group, which is widely spread over Africa.

4. Genetta tigrina (Schreb.).

Sixteen flat skins of a Genet which may probably be referred to this species. They vary much in the amount of spotting on the back, some being thickly spotted with rusty red here, whilst others are quite without these markings. But there are intermediate specimens.

5. Viverra civetta, Schreb.

Three flat skins of this widely-spread species.

6. Herpestes galera (Erxl.); Thomas, P. Z. S. 1882, p. 72.

One flat skin.

7. Cobus crawshayi, sp. nov.

Similis C. ellipsiprymno, *sed colore, præcipue in dorso, saturatiore, et disco anali albo: fascia uropygiali alba nulla, et statura paulo minore diversus.*

Mr. Sharpe sends a single flat skin of the Mweru Waterbuck, and Mr. Crawshay's collection contains 2 heads and 3 flat skins of the same animal. I think there can be no question of its being distinct from *C. ellipsiprymnus*, and I propose to attach to it the name of Mr. Crawshay, who has done such good work on the Antelopes of Nyasaland[1].

The fur of Crawshay's Waterbuck, as will be seen from the skin which I now exhibit, generally resembles that of *C. ellipsiprymnus*, the animal being covered with the same harsh, lengthened, thinly spread hairs. But the colour is considerably darker, being of a dark iron-grey on the dorsal surface, which passes into blackish on the back of the neck, upper portion of the limbs, and tail. This colour gets gradually lighter and more greyish on the flanks, and passes on each side into whitish on the belly. There is no sign of the distinct rump-band which is so clearly marked on *C. ellipsiprymnus*, where it is bordered on each side by dark grey; but in the present species the whole anal disk is white, separated on the dorsal line by the dark medial streak which passes into the short black bushy tail. The whole length of the flat skin in the present example is about 56 inches, the length of the tail about 15 inches.

The horns of Crawshay's Waterbuck, of which I exhibit a fine pair obtained by Mr. Crawshay near Rhodesia, the British Central African Station on Lake Mweru, can hardly be distinguished from those of *C. ellipsiprymnus*. The present pair measure about 24 inches in length along the curve. They are strongly ringed to near their extremities. The points are about 11·5 inches apart.

Assuming the validity of the species just described, I am acquainted with four species of the peculiar group of the genus *Cobus*, commonly called Waterbucks, and distinguished by their rough and elongated hairs, which are longer and divergent on the neck, the tufted tail, and the large, heavy, strongly-ringed horns,

[1] See his article, P. Z. S. 1890, p. 648.

which are lyrate in shape and bend forward at the apex. These four species are as follows:—

1. *C. ellipsiprymnus*[1], which extends from South Africa up the Eastern coast to Somaliland and the While Nile, and may be at once recognized by the elliptical white ring on the rump near the base of the tail.

2. *C. crawshayi*, similar to the preceding, but of a much darker brown, and without the ring on the rump. At present known only from Lake Mweru.

3. *C. defassa*.—This is the *Antilope defassa* (Ruepp. Neue Wir-



Skull and horns of *Cobus crawshayi*.

belth. Säug. p. 9, t. iii.), so-called from its Abyssinian vernacular name "Defassa," which must therefore not be altered into *defassus* as has been attempted by some authors. Herr Matschie (Sitzungsb. Ges. naturf. Freund. Berlin, 1892, p. 134) has lately pointed out the differences between this Abyssinian form and the next, nearly allied, West-African species. There are fine mounted specimens of this Antelope in the gallery of the British Museum.

4. *C. unctuosus*.—The allied West-African form, of which we frequently have examples living in the Society's Gardens and at the present time have a single female specimen, has been generally

[1] See P. Z. S. 1893, p. 505, pl. xxxix., for remarks on this species breeding in our Gardens.

known to us as the Sing-Sing (*C. sing-sing*), from the vernacular name bestowed upon it by Mr. Bennett in 1832 (see Rep. Comm. Zool. Soc. 1832, p. 5). This name was adopted and published by Dr. Gray in 1843 (List Mamm. p. 159), but no description appears to have been attached to the name till 1850, when it was fully described in 'Gleanings from the Knowsley Menagerie,' p. 15. In the meantime, however, the name of *Antilope unctuosa* had been given to it by Laurillard (D'Orbigny's Dict. Univ. d'Hist. Nat. i. p. 622) in 1847. I think, therefore, that this species will have to be called *Cobus unctuosus*.

The Sing-Sing does well in captivity, and I have seen many specimens of it in the Continental gardens, where it has frequently bred. A certain locality for it is the River Gambia, where the Knowsley specimens were obtained for the Derby Menagerie by Whitfield.

8. Cobus lechee.

One flat skin, very like those of *C. vardoni*, but at once recognizable by the black stripes on the front legs and the more widely spread horns.

9. Cobus vardoni (Livingst.); Sclater, P. Z. S. 1892, p. 98.

Three flat skins and two pairs of horns of this species, concerning which and *C. lechee* see Mr. Sharpe's notes.

10. Cervicapra arundinum (Bodd.).

A skull in Mr. Crawshay's series must be referred to *C. arundinum* or a nearly allied form.

11. Æpyceros melampus.

In Mr. Crawshay's series are a skull and a skin of this Antelope, which, according to Mr. Sharpe, is often confounded with the Lechee and Vardon's Antelope under the common name "Mswala."

12. Hippotragus equinus.

Five heads and horns (4 male, 1 female) of the Roan Antelope, which was not included by Mr. Crawshay in his list of the Antelopes of Nyasaland, but certainly occurs in several localities within the Protectorate. Mr. Crawshay also sends a skin of a young male.

In the Shiré Highlands Mr. B. L. Sclater tells me the Roan is equally common with the Sable Antelope. He saw them both on the Trochila plains between Blantyre and Milangi (see Geogr. Journ. i. p. 414), and Mr. Steblecki, a planter on the Chola plateau, told him both were common there.

13. Tragelaphus scriptus roualeyni.

A flat skin of a fœtal specimen, probably of this species. See P. Z. S. 1893, p. 507.

14. TRAGELAPHUS ANGASI, Gray.

Mr. Crawshay sends a skull of this species, which extends its range still further northward. See P. Z. S. 1892, p. 98.

15. TRAGELAPHUS SPEKII, Scl.

A frontlet of this Antelope is in Mr. Crawshay's series. Mr. Sharpe (above) speaks of its occurrence in the swamps of Mweru.

16. POTAMOCHŒRUS AFRICANUS (Schreb.).

Both Mr. Sharpe and Mr. Crawshay have sent home heads, apparently of this species, from the Mweru district.

17. PHACOCHŒRUS ÆTHIOPICUS (Pall.).

The Wart-hog, Mr. Sharpe tells us, is plentiful round Lake Mweru. He sends two skulls and Mr. Crawshay also sends one.

December 5, 1893.

Sir W. H. FLOWER, K.C.B., LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of November 1893 :—

The total number of registered additions to the Society's Menagerie during the month of November was 71, of which 44 were by presentation, 4 were by birth, 10 by purchase, and 13 received on deposit. The total number of departures during the same period, by death and removals, was 99.

The most noticeable additions during the month were :—

1. A Cunning Bassaris (*Bassaris astuta*), purchased November 15th. No example of this interesting carnivorous animal has been exhibited in the Society's collection for many years. The only individual previously received was in the Gardens in 1853, and was the subject of one of Mr. Wolf's Zoological Sketches. (See Wolf and Scl., Zoological Sketches, vol. i. pl. xiv.).

2. Two Jerboas, presented by Capt. R. A. Ogilby, F.Z.S., November 17th, and believed to be referable to one of the Persian Jerboas (*Alactaga decumana*), but the locality of these specimens is not quite certain.

3. A fine adult female of the Caucasian Goat (*Capra caucasica*), presented by H. H. P. Deasy, Esq., 16th Queen's Lancers, Nov. 20th. Mr. Deasy informs me that he obtained a pair of these animals (the "Tur" of the Caucasus) at a village called Ruzbef on the river Backsan, lat. 43° 20′ 0″ N., long. 20° 43′ 35″ E., and had every reason to believe that they were caught on the neighbouring mountains.

Unfortunately the male died on the passage home.

This, so far as I know, is the first example of this most interesting species of Wild Goat that has reached Europe alive[1].



Capra caucasica, ♀.

Prof. G. B. Howes exhibited the heads of two Lampreys and a Hag showing some remarkable variations of the respiratory organs, and made the following statements concerning them:—

Huxley in 1876 demonstrated[2] the existence in the adult Lamprey of "a depression behind each of the pharyngeal vela" . . . which he conceived "to be the remains of the hyoidean cleft which opens externally in the Ammocœte;" Scott[3], Dohrn[4], Parker[5], and Shipley[6] have confirmed this, except that they have confessed themselves unable to detect the presence of its alleged external orifice. Parker in 1883 recorded, on the authority of Prof. Weldon[7], the observation of "seven pairs of pouches" in indi-

[1] On this species and its allies, *Capra cylindricornis* and *C. severtzowi*, see Dr. Menzbier's remarks, P. Z. S. 1887, p. 618.

[2] Journ. Anat. & Phys. vol. x. p. 420.

[3] Morph. Jahrb. Bd. vii. p. 142.

[4] Naples Mittheilungen, Bd. vi. p. 56.

[5] Phil. Tr. 1883, part ii. p. 446.

[6] Q. J. M. S. vol. xxvii. p. 349.

[7] *Loc. cit.* p. 384. My friend Prof. Weldon informs me that his specimen "had seven complete gills on the right side and seven plus a ductus on the left." It has been lost, but a figure and description of it are to appear in Mr. W. Bateson's forthcoming work on Variation.—G. B. H.

viduals of *Myxine glutinosa*, and it is well known that Johannes Müller's substitution[1] of the generic name *Bdellostoma* for Duméril's "*Heptatrema*" was directly expressive of numerical variation of the branchiæ. In knowledge of these facts he (Prof. Howes) had lost no opportunity of seeking for additional evidence of variation of the parts in question, and the condition of the heads now exhibited appeared to him sufficiently interesting to warrant the publication of his results.

Petromyzon fluviatilis.—He exhibited two specimens (both "females")[2]. In the larger of them the first branchial aperture of the left side (fig. 1 *a* [which was visible only under a hand-lens]) was but one-third the size of its fellows and longitudinally instead of vertically disposed. Its free border was uniformly fimbriated and bounded, not an orifice, but a shallow cutaneous depression (*br*. I,

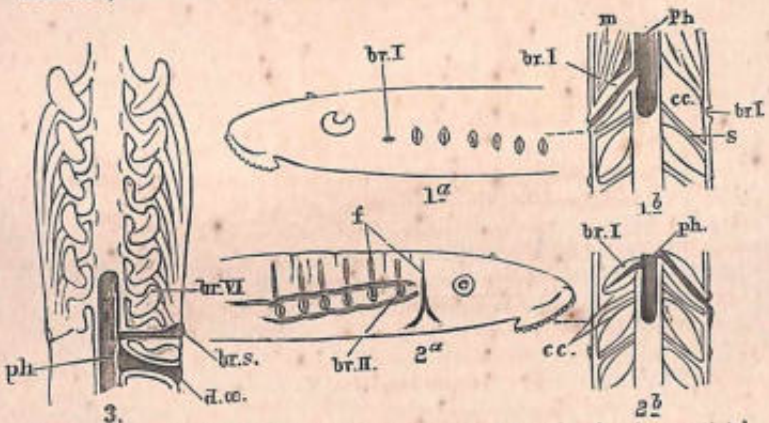


Fig. 1 *a*. *Petromyzon fluviatilis*, 25·5 centim. total length, showing vestigial first gill on left side. Fig. 1 *b*. The same, dissected from beneath. Fig. 2 *a*. *P. fluviatilis*, 23·5 centim., showing absence externally of first gill on right side. Fig. 2 *b*. The same dissected from beneath. Fig. 3. *Myxine glutinosa*, dissection from beneath of a specimen possessed of a supernumerary gill on the left side.

1 *a*, 2 *a*, nat. size. 1 *b*, 2 *b* × 1½. 3 × 1½.

Reference letters.—*br*., branchiæ; *br.s*., supernumerary branchia; *cc*., peribranchial blood-lymph sinuses; *d.œ*., œsophago-cutaneous duct; *f*., tegumental furrows; *ph*., pharynx laid open from beneath; *s*., interbranchial septum.

fig. 1 *b*) which was closed internally. On dissection, the ventral aorta was found to give off six branches on the left side and seven on the right; and, in accordance with this reduction, the gill corresponding to the vestigial orifice was entirely absent, its place being occupied by an extensive blood-lymph sinus (*cc*.) homologous with those of the normal peribranchial series. In the second specimen, the opposite (right) side was somewhat similarly affected in the corresponding region. Viewed externally (fig. 2 *a*) the

[1] ("Myxinoiden") Abhandl. Akad. Wiss. Berlin, 1834, p. 79.

[2] Beard has recently discovered the presence of ova in the testis of *P. planeri*, Brit. Assoc. Rep., Edinburgh, 1892, p. 790, and Anat. Anz. vol. viii. p. 60.

first gill-perforation was seen to be wholly unrepresented; the area of its occurrence was crossed by the anterior of a recurrent series of vertical furrows (*f*) coincident in position with the branchial apertures, but these, together with a depression of the entire branchial region, appeared to be the mere effects of shrinkage during preservation. On dissection (fig. 2 *b*), the ventral aorta was found to give off seven symmetrically disposed pairs of afferent branchial vessels; but, this notwithstanding, the right anterior gill-sac (*br.* I) was a feebly developed one, ending blindly some little distance from the integument, and, but for the possession of gill-folios, it recalled the condition of Huxley's vestigial "hyoidean cleft" as observed by subsequent investigators. The suppression of the parts was thus seen to be of the opposite order in the two examples, *i. e.* that possessed of the tegumental pit lacked the true gill and *vice versa*; and the gills of the opposite side were in each case normal in every detail. The facts appeared to him to show that, although (in view of the well-known existence of more than five pairs of branchial arches and clefts in the living Sharks *Notidanus* and *Chlamydoselachus*[1], of the partial development of a sixth branchial cleft in *Raja* and *Torpedo*[2], and of a sixth branchial arch in *Protopterus*, and of the alleged presence in *Bdellostoma polytrema* of 13 or 14[3] gill-apertures, and in *B. bischoffii* of 10[4]) reduction of the branchial apparatus in both the Marsipobranchii and the true Pisces would appear to be the outcome of suppression postero-anteriorly, there was now before the Society evidence of a tendency on the part of the living Petromyzontidæ towards numerical reduction of the precisely opposite order—*i. e.* antero-posteriorly. With respect to this, as to certain salient features in their organization[5], the Marsipobranchii exhibit modification the precise converse of that of the gnathostomatous Vertebrata.

Myxine glutinosa.—One specimen exhibited, for the discovery of which Prof. Howes was indebted to his pupil Mr. H. B. Lacy. Externally it bore (fig. 3) two respiratory orifices on its left side, instead of one, viz. a smaller anterior one (*br.s.*) which gave exit to the collective series of branchial passages, and a larger posterior one (*d.œ.*) alone related to the œsophago-cutaneous duct. This unique feature of the specimen was accompanied by the presence of a seventh gill (*br.s.*), as indicated in the accompanying figure; special interest attaches to this, on account of Parker's suggestion[6] that the ductus œsophago-cutaneus is "a sort of abortive gill-cleft . . . the morphology of which is self-evident," and as it furnishes us with a variation in the Common Hag closely akin to that of the "*Bdellostoma heterotrema*" of Joh. Müller (*cf.* Myxinoiden, pl. vii. fig. 3).

[1] *Cf.* Garman, Bull. Mus. Comp. Zool. Camb. Mass. vol. xii. no. 1., and Günther, 'Challenger' vols. 'Zoology', vol. xxii. p. 2.
[2] Wyman; Beard, *cf.* Q. J. M. S. vol. xxvi. pp. 108, 109 (1886).
[3] *Cf.* Günther, Brit. Mus. Cat. Fishes, vol. viii. p. 512, and Schneider, Wiegmann's Archiv f. Naturgesch. Bd. xlvi. p. 115.
[4] Schneider, *loc. cit.*
[5] *Cf.* Trans. Liverpool Biol. Soc. vol. vi. p. 141.
[6] *Loc. cit.* p. 384.

On careful dissection the supernumerary gill (*br.s.*) was seen to be externally confluent with the prolonged lip of that in front of it (the normal sixth one), while internally its orifice approximated most nearly to that of the œsophago-cutaneous duct. As a whole, it was disposed transversely, instead of obliquely backwards as are the normal gills; its presence had slightly disturbed the symmetry of the fifth and sixth pairs of gills and the œsophago-cutaneous duct, and its relations were such that it might well have been derived from either that structure or the sixth gill. Unfortunately, the ventral aorta had been so far dissected before the specimen came into Prof. Howes's hands, that it was impossible to follow out the clue which the afferent branchial vessels might perhaps have given to the origin of this extra gill. On minute examination, the external prolongation of this was found to contribute the major share to the adjacent exhalant passage, and to receive rather than merely unite with the gill-passages in front. In this it resembled the ductus œsophago-cutaneus. There can now be little doubt that in Günther's *Bdellostoma cirrhatum* we are dealing with a species in which the gills are individually variable from 6 to 7 on either side; and in view of the undoubtedly less specialized condition of the branchial apparatus of this genus than that of *Myxine*, there was reason for suspecting that the appearance of a seventh gill on the right side in the latter might be a reversional variation, and if so, that the supernumerary gill of the left side might be of a similar nature, and the œsophago-cutaneous duct *sui generis* distinct from it, if not from the true gills in general. To this view he himself inclined.

The specimens exhibited were the only ones out of at least a hundred of both species examined in which the branchiæ were thus aberrant.

The following papers were read:—

1. On the Geographical Distribution of Earthworms. By Frank E. Beddard, M.A., F.R.S., Prosector to the Society.

[Received November 21, 1893.]

In my forthcoming Monograph of the Oligochæta I propose to attempt a general survey of the distribution of the terrestrial forms; the present communication is an abstract of the chapter on that subject.

I allow 69 genera of Earthworms, which are distributed as follows:—

PALÆARCTIC REGION.

(Fam. Lumbricidæ.)

Lumbricus.
Allolobophora.
Allurus.
Tetragonurus.

(Fam. GEOSCOLICIDÆ.)
Hormogaster.
Criodrilus.
Sparganophilus.
(Fam. CRYPTODRILIDÆ.)
Pontodrilus.
Microscolex.

NEARCTIC REGION.

(Fam. LUMBRICIDÆ.)
Lumbricus.
Allolobophora.
Allurus.
Tetragonurus.
(Fam. CRYPTODRILIDÆ.)
Ocnerodrilus.
Plutellus (? included in *Megascolides*).
(Fam. ACANTHODRILIDÆ.)
Diplocardia.
Benhamia.
Kerria.

ORIENTAL REGION.

(Fam. LUMBRICIDÆ.)
Lumbricus.
Allolobophora.
(Fam. GEOSCOLICIDÆ.)
Glyphidrilus.
Annadrilus.
Pontoscolex.
Bilimba.
(Fam. CRYPTODRILIDÆ.)
Deodrilus.
Typhæus.
Microdrilus.
(Fam. MONILIGASTRIDÆ.)
Desmogaster.
Moniligaster.
(Fam. ACANTHODRILIDÆ.)
Benhamia.
(Fam. EUDRILIDÆ.)
Eudrilus.
(Fam. PERICHÆTIDÆ.)
Perichæta.
Megascolex.
Perionyx.

AUSTRALIAN REGION.

(Fam. LUMBRICIDÆ.)

Lumbricus.
Allolobophora.
Allurus.

(Fam. GEOSCOLICIDÆ.)

Pontoscolex.

(Fam. CRYPTODRILIDÆ.)

Cryptodrilus.
Megascolides.
Digaster.
Pontodrilus.
Dichogaster.
Trinephrus.
Fletcherodrilus.
Microscolex.

(Fam. ACANTHODRILIDÆ.)

Acanthodrilus.
Octochætus.
Deinodrilus.
Plagiochæta.

(Fam. EUDRILIDÆ.)

Eudrilus.

(Fam. PERICHÆTIDÆ.)

Perichæta.
Megascolex.
Diporochæta.

NEOTROPICAL REGION.

(Fam. LUMBRICIDÆ.)

Lumbricus.
Allolobophora.

(Fam. GEOSCOLICIDÆ.)

Geoscolex.
Anteus.
Rhinodrilus.
Tykonus.
Urobenus.
Pontoscolex.
Onychochæta.
Diachæta.

(Fam. CRYPTODRILIDÆ.)

Oenerodrilus.
Gordiodrilus.
Pontodrilus.
Cryptodrilus (?).
Microscolex.

(Fam. ACANTHODRILIDÆ.)
Trigaster.
Benhamia.
Kerria.
Acanthodrilus.
(Fam. EUDRILIDÆ.)
Eudrilus.
(Fam. PERICHÆTIDÆ.)
Perichæta.

ETHIOPIAN REGION.

(Fam. LUMBRICIDÆ.)
Allolobophora.
Allurus.
(Fam. GEOSCOLICIDÆ.)
Ilyogenia.
Kynotus.
Microchæta.
Siphonogaster.
Callidrilus.
(Fam. CRYPTODRILIDÆ.)
Gordiodrilus.
Pygmæodrilus.
Dichogaster (?).
(Fam. ACANTHODRILIDÆ.)
Benhamia.
Acanthodrilus.
(Fam. EUDRILIDÆ.)
Eudrilus.
Pareudrilus.
Teleudrilus.
Stuhlmannia.
Polytoreutus.
Heliodrilus.
Hyperiodrilus.
Lybiodrilus.
Nemertodrilus.
Preussia.
Eudriloides.
Megachæta.
Notykus.
Platydrilus.
Paradrilus.
Alvania.
Reithrodrilus.
Metadrilus.
(Fam. PERICHÆTIDÆ.)
Megascolex.
Perionyx.
Perichæta.

Before commenting upon the facts rendered apparent in this list, it will be necessary to correct it in one or two particulars. In the first place, it will be noticed that the genera *Lumbricus* and *Allolobophora*, and also, though to a less extent, *Allurus*, are nearly world-wide in range. I believe that this extensive range is accidental, and due to the interference of man. This opinion is based upon the following facts. In such countries as Australia the presumably indigenous fauna (*Cryptodrilus*, *Megascolides* &c.) is met with only at some distance from towns: the gardens of the latter contain Lumbricids only[1]. In no case is a member of this family from any country outside the territories covered by the Palæarctic and Nearctic regions specifically different from forms living within those two regions. If the exotic *Lumbricidæ* were indigenous to such countries as New Zealand and South America, it might be fairly expected that they would show at the very least varietal differences; but they do not. So, too, with the few *Perichætidæ* found in Europe; they are identical with exotic forms, and have not been included in the above list.

The same argument cannot perhaps be applied to the North-American Continent; although the majority of species belonging to this family that occur there are the same as European forms, there are a few which are peculiar. It seems to me to be exceedingly possible that the same line of argument can be applied to the genera *Eudrilus* and *Pontoscolex*. The latter genus has three species; one of these, which was the earliest to be described, viz. *Pontoscolex corethrurus*, is found in many widely separated parts of the world. Individuals from Queensland show precisely the same characters as others from British Guiana. Without stronger proof than we have at present to the contrary, I should be disposed to consider the genus to be American (Neotropical), and to have been transferred accidentally to other countries. I may mention that in gatherings of Earthworms which have been accidentally brought to the Royal Gardens, Kew, in Wardian cases, this species is about the commonest form. The same line of argument applies to *Eudrilus eugeniæ*; but in this case I should look upon tropical Africa as the real home of the species, common though it is in tropical America.

The above table, being, I hope, a complete list of the distribution of the genera of Earthworms, does not bring out into relief the characteristic features of the several regions; for instance, *Perichæta* and *Megascolex* and also *Perionyx* are rare in tropical Africa. *Cryptodrilus* is only known from the Neotropical region by one species doubtfully referable to the genus. Taking those genera which are abundant in species and in individuals and leaving aside genera which are rare and only known by a single species, the following list of the Earthworm-faunas of Mr. Sclater's Regions may be drawn up:—

Palæarctic region.—*Lumbricus*, *Allolobophora*, *Allurus*, *Criodrilus*.

Nearctic region.—*Lumbricus*, *Allolobophora*.

[1] I am indebted for this interesting fact to Prof. Spencer of Melbourne.

ORIENTAL REGION.—*Perichæta, Megascolex, Perionyx, Typhæus.*
AUSTRALIAN REGION.—*Megascolex, Diporochæta, Acanthodrilus, Digaster, Cryptodrilus, Megascolides.*
NEOTROPICAL REGION.—*Anteus, Rhinodrilus, Urobenus, Pontoscolex, Diachæta, Ocnerodrilus, Kerria, Acanthodrilus, Perichæta.*
ETHIOPIAN REGION.—*Microchæta, Kynotus, Siphonogaster, Gordiodrilus, Pygmæodrilus, Benhamia,* and *Eudrilidæ.*

It is clear from this abbreviated list that the Ethiopian and Neotropical regions are the richest in abundant peculiar genera; that there is the closest resemblance between the Nearctic and the Palæarctic regions; that there is a less close resemblance between the Oriental and the Australian regions, in that both are characterized especially by *Perichætidæ* and *Cryptodrilidæ*; but it appears to me that the Australian region of Mr. Sclater does not express the facts of the distribution of Earthworms. New Zealand is so different. There we have *Acanthodrilidæ* (belonging to four genera) forming the characteristic fauna and a very few *Cryptodrilidæ* and *Perichætidæ*; in Australia, on the other hand, we have the two families *Cryptodrilidæ* and *Perichætidæ* extremely abundant and varied and the merest trace of the family *Acanthodrilidæ* (three species only). The Earthworm-fauna of New Zealand in fact is less like that of the Australian continent than it is like Patagonia and some of the intervening islands; from Patagonia, the Falkland Islands, Kerguelen and Marion Islands the only Earthworms that are known belong to the genus *Acanthodrilus.* The amount of information on this subject is not large, but it can hardly be an accidental circumstance that the four or five collections of worms examined from these different parts of the world should have consisted only of members of the genus *Acanthodrilus*; it must at least indicate that that genus is the prevalent form.

I should therefore propose an Antarctic region to comprehend the tract of continent and islands just mentioned. With this exception and possibly with the exception of the Nearctic and Palæarctic, which ought perhaps, from the point of view of Earthworms, to be fused into one circumpolar region, I think that the facts in the distribution of the Earthworms confirm the justice of distinguishing the rest of Mr. Sclater's regions, viz. Oriental, Neotropical, and Ethiopian. North of the Sahara the Earthworms, so far as we know them, belong to European genera. I should not, however, in every case make the boundaries of these regions along exactly the same lines as those usually adopted. Japan, for example, which possesses a good many *Perichætidæ*, ought, I believe, to be referred to the Oriental region: perhaps the Australian region should be limited to the continent of Australia; such worms as I have seen from Borneo conform to the Oriental rather than to the Australian type. On various points of this kind information is greatly wanted; it is an easy thing to collect these animals, and they can be readily preserved by killing them in very weak spirit and then preserving them in strong spirit, which should be changed once or twice.

2. On a Collection of Coleoptera sent by Mr. H. H. Johnston, C.B., from British Central Africa. By C. J. Gahan, M.A.

[Received November 16, 1893.]

This collection includes altogether examples of about 90 species of Coleoptera, some of which, especially amongst the Cetoniidæ, are represented by good series. Of many of the species there are unfortunately only a few specimens, and these are as a rule not in a very good state of preservation. It has been possible, however, to identify the great majority of the species; and eight of those which are believed to be new are here described. Occasion has also been taken to describe a few new forms which have been investigated in the course of working out this collection, but which are not included in it.

These Coleoptera were all collected at Zomba by Mr. Alexander Whyte, F.Z.S., Mr. Johnston's Naturalist, so that, when not otherwise stated in the text, this locality is to be understood as the habitat of the species. Few of the species call for special remark. *Goliathus albosignatus*, Bohem., and *Ceratorhina princeps*, Oberth., not hitherto represented in the British Museum collection, are amongst the finer species taken. *Epicauta nyassensis* and *Diacantha conifera* must, judging from the numbers sent over, be very abundant in this region. The Longicorns are poorly represented, though the number of new forms is proportionally large.

Carabidæ.

1. Anthia fornasini, Bertol.

Staphylinidæ.

2. Staphylinus procerus, sp. n.

Niger; capite prothoraceque supra violaceo-cuprascentibus, creberrime reticulatim punctatis, punctis setigeris, linea media pronoti læviore et nitidiore; elytris crebre minutiusque punctatis, atro-tomentosis, grisco-plagiatis; abdomine supra atro-tomentoso, segmentis 2°, 3°, 6°, 7° utrinque grisco-plagiatis; corpore subtus leviter pubescente, nitidiore, segmentis abdominis utrinque grisco-sericeo maculatis; tarsis anterioribus et tibiis apice nonnihil fulvo-setosis; antennis nigris, basi subtus plus minusve testaceis. Long. 27, *lat.* 6 *mm.*

One female was taken at Zomba.

Four examples, including two males and two females, of what I consider to be this species are amongst the Coleoptera collected by Emin Pasha at Karaguë. These differ from the Zomba specimen in that the greyish or somewhat fulvous-grey pubescence extends over a greater surface on the elytra, and leaves only a few small patches black. In the Zomba specimen the entire posterior third of the elytra as well as small patches anteriorly are black. The somewhat silvery-grey spots on the underside of the abdomen

seem to form two series on each side in the female, one series on each side in the male. The latter sex is also characterized by a rather deep incision in the last ventral segment, and by the presence of a small tuft of hairs lodged in a slight depression near the middle of the penultimate ventral segment.

SCARABÆIDÆ.

3. TROX MELANCHOLICUS, Fåhr.

4. TROCHALUS, sp.

5. ANOMALA, sp.

6. POPILLIA SERENA, Har.

A number of specimens varying considerably in colour seem to be referable to this species. The shades of colour occurring in different individuals include leaf-green, dark blue, and bluish green; while a few even present coppery or slightly brassy tints. No difference of structure or punctuation accompanies these variations of colour, so that all the specimens doubtless belong to the same species.

7. POPILLIA DISTINGUENDA, Fairm.

Two examples of this form were taken at Zomba which with difficulty only could be distinguished from a variety of the Chinese species *Popillia castanoptera*, Hope. They differ from the described type of *P. distinguenda*, Fairm., in having a dark band along the outer margin of each elytron.

8. GOLIATHUS ALBOSIGNATUS, Bohem.

One example. Recent authorities seem agreed in considering this species distinct from *G. kirkianus*, Gray. Its presence as far north as Zomba shows, however, that it has a wider distribution than has been previously attributed to it, and that it occurs in practically the same locality as Gray's species.

9. RANZANIA PETERSIANA, Klug.

10. NEPTUNIDES POLYCHROUS, Thoms.

11. CERATORHINA PRINCEPS, Oberth.

Ceratorhina princeps, Oberth. Bull. Soc. Ent. Fr. 1880, p. cxix; Bates, Ent. Mo. Mag. xviii. p. 156.

This species is barely more than named by Oberthür in the work cited. The characters of the male are described by Bates. In the majority of the specimens taken at Zomba, forming a tolerably complete series, two somewhat evanescent greenish spots are to be seen on the pronotum.

12. HETERORHINA ELONGATA, Bates.

Heterorhina elongata, Bates, Ent. Mo. Mag. xviii. p. 157.

One example.

13. GENYODONTA QUADRICORNIS, O. Janson.

14. Cetonia impressa, Goldfuss.

15. Rhabdotus aulica, Oliv.

16. Diplognatha hebræa, Oliv.

17. Diplognatha silicea, McLeay.

18. Pseudoclinteria infuscata, Gory & Perch.

19. Oxythyrea vitticollis, Bohem., var.

Vitta nigra pronoti medio late interrupta, elytris viridescentibus.
Two examples.

Buprestidæ.

20. Sternocera funebris, Bohem.

21. Psiloptera proxima, Klug.

22. Psiloptera amicta, Fåhr.

23. Psiloptera, sp.

24. Psiloptera, sp.

Lycidæ.

25. Lycus, sp.

One female example.

Tenebrionidæ.

26. Trachynotus sordidus, Gerst.

27. Anchophthalmus silphoides, Gerst.

28. Catamerus rugosus, sp. n.

Oblongo-ovatus, viridi-niger aut niger, prothorace sat dense punctulato, viridescente aut nigro aut cæruleo-nigro ; elytris longitudinaliter striatis, interstitiis elevatis et rugosis. Long. 19–21, *lat.* 7–9 *mm.* ♂ ♀.

Colour varying from a greenish black or black to a dark blue on the thorax, and from a very dark green to black on the head and elytra. Legs and underside bluish black or black, and more glossy than the upperside. Prothorax finely punctured, convex, with its lateral margins almost regularly rounded in some examples, in others presenting a slight irregularity or nearly obsolete crenation. Elytra longitudinally striate, with the intervals raised and irregularly punctured and wrinkled, so that they have a somewhat roughly granular appearance throughout almost their whole extent. Posteriorly the elytra are strongly declivous or subvertical.

In the male the elytra are somewhat narrower relatively to the prothorax than in the female. The sexes may further be easily distinguished by the much thicker anterior femora of the male, which are armed also with a stronger and somewhat curved spine.

Three species of the genus *Catamerus* have been hitherto described, viz. :—

C. revoili, Fairm., Ann. Soc. Ent. Fr. 1887, p. 290, pl. 2. fig. 12. Mpwapwa, E. Africa.

C. transvaalensis, Pering. Trans. S. Afric. Phil. Soc. vi. 2, p. 12. Transvaal.

C. fairmairei, Alluaud, Bull. Soc. Ent. Fr. 1892, p. ccxxxix. ? Zanzibar.

The last two are possibly identical, the descriptions agreeing tolerably well. All agree in having the intervals between the striæ of the elytra smooth and convex, and are therefore quite distinct from the species just described.

A fifth species [1], however, is known to me in which this difference is not so strongly marked, the characters of its elytra giving it a place intermediate between *C. revoili* and *C. rugosus*.

CANTHARIDÆ.

29. MYLABRIS DICINCTA, Bertol.

30. MYLABRIS BIHUMEROSA, Mars.

31. MYLABRIS TRISTIGMA, Gerst. ?

32. EPICAUTA NYASSENSIS.

Lytta nyassensis, Haag, Deut. ent. Zeitsch. 1880, p. 62.
Epicauta dichrocera, Gerst. Jahrb. Hamb. Anst. i. p. 58.

From the number of examples taken, this species appears to be common in the Nyasa region.

33. EPICAUTA, sp.

One example. The species seems to come near *E. bilineata*, Haag.

34. CORYNA APICIPUSTULATA, Mars.

CURCULIONIDÆ.

35. LIXUS, sp.

36. SPHADASMUS CAMELUS, Gyll.

37. ATTELABUS (PLEUROLABUS), sp.

CERAMBYCIDÆ.

38. MECASPIS WHYTEI, sp. n.

♂. *Chalybeato-violacea, supra subtiliter atro-velutina; antennis pedibusque nigris, tarsis anticis mediisque supra griseis, tarsis posticis argenteo-sericeis; scutello elongato, postice valde attenuato, supra transverse rugoso; corpore subtus tenuiter argenteo-*

[1] CATAMERUS INTERMEDIUS, sp. n.

Niger; elytris æneo-viridibus, punctato-striatis, intervallis elevatis, remote punctatis, et in quibusdam locis (præcipue versus latera) fortius transversequa punctatis vel rugosis. Long. 20–21 *mm.*

Hab. Zambesi (Brit. Mus. collection).

sericeo, metasterni abdominisque medio subglabro. Long. 28, *lat.* 9 *mm.*; *long. scutelli* 3 *mm.*

Violet-coloured, with the legs and antennæ black. Pronotum and elytra covered with a dark velvety pile, scarcely dense enough to obscure the dark-blue and violet colour of the derm except near the base of the elytra and on the middle of the pronotum, with a narrow glabrous and sparsely punctured band extending for some distance along the middle of each elytron between the horizontal sutural region and the more oblique lateral portion. The disk of the prothorax may be observed in places, where the pile is rubbed away, to be transversely wrinkled. The scutellum is rather elongated, much attenuated behind, and transversely rugose above. The prosternal process is very feebly and obtusely tubercled behind. The fifth and sixth ventral segments of the abdomen in the male are somewhat arcuately emarginate behind. The intermediate femora each bear a blunt tooth or rather tubercle on the underside near the apex; on the anterior femora the apical tooth is still more obsolete. The male antennæ are a little longer than the body.

39. PHILEMATIUM NITIDIPENNE, Gahan.

Philematium nitidipenne, Gahan, Trans. Ent. Soc. Lond. 1890, p. 307.

One example in a fragmentary condition.

40. ANUBIS FRONTALIS, sp. n.

Linearis, chalybeato-cyaneus; capitis fronte supra dense punctata, epistomo (a fronte linea transversa diviso) sparsius punctato; prothorace sat fortiter denseque punctato; elytris subtilius confluenter punctatis, utrisque plagis tribus flavis—una humerali, secunda ante medium, tertia pone medium; pygidio apice sat late rotundato, medio obsolete emarginato; antennis versus apicem modice incrassatis. Long. 15–17 *mm.* ♂ ♀.

From *A. clavicornis*, Fabr., and allied forms the present species is chiefly to be distinguished by its less incrassated antennæ and by the punctuation of the head and prothorax. The front of the head bears a tolerably distinct transverse line across the middle, which divides it into an upper more thickly punctured portion, and a lower more sparsely punctured epistomal region; the vertex also between the eyes is very sparingly punctured. The punctures of the prothorax are close and somewhat confluent on the lateral portions of the disk; but those along the middle of the disk and on the sides of the prothorax are less closely placed and have distinct intervals between them.

In *clavicornis*, Fabr., and *scalaris*, Pasc., the head and prothorax are more closely and somewhat more strongly punctured. The lower or epistomal portion of the front of the head is almost or quite as thickly punctured as the upper portion, and there is as a rule no distinct impressed line separating the two. The prothorax is very closely and pretty uniformly punctured.

Following his description of *Anubis dissitus* (Cist. Ent. ii. p. 412) Bates remarks that "*A. clavicornis* (= *sexmaculatus*, White), *dissitus* and *scalaris*, Pasc., are distinguishable from each other by the form of the pygidium. In *clavicornis* it is sinuated or notched at the apex, in *scalaris* abruptly narrowed and subacute, in *dissitus* rounded." This statement coming from so eminent and careful an authority is likely to create confusion. In but a single specimen of *clavicornis* out of several that I have examined (including the Fabrician type) did I find the pygidium to be sinuate, and in that one it was only slightly so; in all the others it was rounded. In *scalaris*, Pasc., also, the pygidium is rounded. Bates probably mistook for the latter an undescribed species (*A. bohemanni*, White MS.) in which the pygidium is rather sharply pointed and slightly curved outwards at the apex. In this species also the fifth ventral segment is rather strongly emarginate behind. In markings it resembles *A. scalaris*, Pasc.

41. LOPHOPTERA ASPERULA, White.

42. TRAGOCEPHALA VARIEGATA, Bertol.

43. CEROPLESIS CAFFER, Thunb.

44. CYMATURA BIFASCIATA, Gerst., var. NIGRIPENNIS.

Elytris omnino nigris.

This variety is only to be distinguished from the form described and figured by Gerstaecker by its wanting the two ochreous transverse bands of the elytra which are present in that form. The elytra and the pubescence that covers them are entirely black.

45. NITOCRIS SIMILIS, sp. n.

♀. N. abdominali (*Fåhr.*) *supra sat similis sed paullo major; metathorace utrinque nigro-plagiato; abdomine nigro, subtiliter atro-pubescente, segmentis* 1°, 2°*que utrinque triangulariter fulvo-sericeo-plagiatis, segmento* 4° *transversim fulvo-sericeo-fasciato; segmento ultimo medio late subdepresso et dense nigro-tomentoso; pedibus flavo-testaceis, tarsis omnibus supra et tibiis posticis nigris. Long.* 23–28 *mm.*

This species closely enough resembles *N. abdominalis* when seen from above, but may be distinguished by the characters of the underside. There is a black transverse or oblique patch, of greater or less extent, on each side of the hind part of the metathorax; the first abdominal segment has a large triangular fulvous sericeous spot on each side, the anterior and posterior margins of the segment being also narrowly fulvous; the second has also a triangular fulvous spot on each side (in some examples a very small fulvous spot appears at the postero-lateral angle of the third segment); the fourth has a narrower transverse spot on each side, the two spots of this segment forming together a transverse band slightly interrupted in the middle; the last segment is somewhat broadly depressed in the middle of its ventral surface,

and the depression, which is narrower anteriorly and widens out in a somewhat arcuate manner posteriorly, is closely covered with a black tomentum.

Some female examples from Mamboia and from Delagoa Bay agree with the example from Zomba in presenting the characters detailed above.

In a male example from Natal, which in all probability belongs to this species, the following sexual differences may be noted:—The first abdominal segment is entirely of a pale yellowish-white colour; the last ventral segment is flattened or slightly concave from side to side along the middle, and is only very faintly pubescent.

Chrysomelidæ.

46. Sagra johnstoni, sp. n.

Cyanea, elytris viridibus subnitidis leviter cupreo-tinctis.

♂. Femoribus posticis basi intus fulvo-tomentosis, prope apicem subtus bidentatis, dente postica paullo majore; femoribus intermediis subtus obtuse dentatis vel tuberculatis; segmento basali abdominis medio longitudinaliter subdepresso, crebre punctulato, et fulvo-pubescente. Long. 14, *lat.* 5½ *mm.*

This species seems to be most nearly allied to *S. bicolor*, Lac. (=*festiva*, Gerst.), of which it has the general form. The oblique depression at the base of each elytron just above the shoulder is, however, more strongly marked; the elytra are more nitid and are greenish rather than purplish in colour; and the hind femora are each armed underneath near the apex with two small teeth on the outer edge, the distal tooth being only slightly larger than the proximal one.

47. Corynodes dejeani, Bertol.

One example.

48. Corynodes zombæ, sp. n.

Supra obscure viridis, elytris interdum violaceo plus minusve tinctis; pronoto sat dense punctato, interstitiis minutius punctulatis; elytris crebre punctatis, subrugulosis, interstitiis minute punctulatis; corpore subtus cyaneo-violaceo, pedibus cyaneis; articulis quinque ultimis antennarum sat fortiter dilatatis. Long. 12 *mm.*

Upperside of a rather dark greenish colour, with the elytra in some examples more or less strongly tinged with violet or purple. Pronotum with some larger and less thickly distributed punctures, the intervals between which are thickly and minutely punctulate. Elytra closely punctured, with many of the punctures drawn out in a transverse direction so as to give to the elytra a slightly rugulose appearance, and with the interstices between the punctures very minutely punctulate.

In general form this species resembles *C. compressicornis*, Fabr., but differs in having the distal five joints of the antennæ a little more strongly dilated, and the pronotum and elytra more thickly punctured.

It is very difficult to decide the limits of a species in this genus, inasmuch as the colours not only vary to a considerable extent, but the punctuation also is by no means constant. As, however, I have not seen examples of the form described above from any other locality, I have thought it well to give it a name.

49. COLASPOSOMA CYANEOCUPREUM, Fairm.

Colasposoma cyaneocupreum, Fairm. Ann. Soc. Ent. Fr. (6) vii. (1887) p. 352.

Two examples.

50. COLASPOSOMA, sp.

51. CERALCES FERRUGINEUS, Gerst.

52. CERALCES NATALENSIS, Baly.

53. ATECHNA CLARKI, Baly.

54. OIDES COLLARIS, Baly.

55. DIACANTHA DISTINCTA, sp. n.

Capite prothoraceque fulvescentibus; elytris crebre punctatis, cyaneis (tuberculis ad basin in mare fulvis, exceptis); antennis (basi exceptis) pedibusque nigris; corpore subtus nigro, segmento ultimo fulvo. Long. 9–10 *mm.*

Hab. Zomba, Moimba ?, and Zambesi.

The basal tubercles of the male elytra resemble those of *D. conifera*, Fairm., but are not quite so strong and prominent. Very close to the hind margin of the pronotum there are, in the male, two small lunate pits or depressions—one on each side of the middle line nearly opposite the elytral tubercles. At the middle of the hind margin the pronotum does not send back a distinct process to overlap part of the scutellum, as happens in the males of some species of this genus. These characters of the male, together with the close and rather strong punctuation of the elytra in both sexes, will suffice to distinguish the species.

One male example only was in the collection made by Mr. Whyte at Mount Zomba; a male and two females ticketed "Moimba" and a male from Zambesi are also in the British Museum collection.

56. DIACANTHA CONIFERA, Fairm.

Diacantha conifera, Fairm. Ann. Soc. Ent. Belg. xxvi. (1882) p. lvi.

Numerous examples, most of which have arrived in a very bad condition, are in the collection from Zomba. The species is also well represented in the British Museum collection by specimens from "Moimba" and Mamboia (Baly Coll.) and from Lake Ngami.

It is doubtful whether it is to this species or to the one which I

characterize below [1] that Gerstaecker's description and figure of *D. divisa* better apply. His species was founded upon one female specimen taken at Tette.

57. Ootheca, sp. inc.

This species appears to be new; but the specimens are not in a sufficiently satisfactory condition to admit of detailed description.

58. Pachytoma gigantea, Illig.

This has a very wide distribution in Africa. It appears to be abundant at Zomba.

59. Cassida hybrida, Bohem.

60. Cassida parummaculata, Bohem.

Coccinellidæ.

61. Cydonia lunata, Fabr.

62. Epilachna paykulli, Muls.

63. Epilachna hirta, Thunb.

64. Epilachna dregei, Muls.

P.S., December 27th, 1893.—Since this communication was read examples of the following species, also collected at Zomba and preserved in alcohol, have come to hand:—

Cicindelidæ.

65. Cicindela clathrata, Dej.

Carabidæ.

66. Graphipterus salinæ, Bertol.

67. Scarites superciliosus, Klug.

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[1] Diacantha mutica, sp. n.

? *D. divisa*, Gerst. (*Galleruca*).

D. coniferæ *similis, sed differt antennis crassioribus et paullo brevioribus, margine postica pronoti in utroque sexu arcuato-rotundata; scutello nigro; elytris densius punctatis, minus nitidis, utrisque in mare juxta scutellum leviter foveolatis, haud tuberculatis.*

Hab. Natal.

Head, prothorax, abdomen, the two basal joints of the antennæ, and rather more than the anterior third of the elytra fulvous; the rest black. Pronotum with a foveolate depression on each side near the middle of its length, and in the male with two very small foveæ not widely separated and placed close to the hind margin; the latter somewhat rounded in both sexes, but a little less obtuse in the male. Elytra rather thickly punctured and submitid; each in the male with a small pit placed close by the side of the scutellum. The outer edge of this pit is slightly raised and is all that represents the strong and prominent tubercle occupying a similar position in *D. conifera* and other species of the genus.

All the examples I have seen are from Natal.

68. Tefflus violaceus, Klug.
69. Tefflus delegorguei, Guér.
70. Cyclosomus, sp.
71. Rhathymus melanarius, Klug.

Gyrinidæ.

72. Orectochilus bicostatus, Boh.

Scarabæidæ.

73. Anachalcos convexus, Bohem.
74. Catharsius platycerus, Klug?
75. Heliocopris japetus, Klug.
76. Onthophagus bicallosus, Klug.
77. Lepidiota lepidota, Klug.
78. Adoretus, sp.
79. Cyphonistes vallatus, Wied.

Buprestidæ.

80. Agrilus grandis, L. & G.

Tenebrionidæ.

81. Zophosis agaboides, Gerst.
82. Rhytidonota gracilis, Gerst.
83. Psammodes dimidiatus, Haag.?

Cantharidæ.

84. Epicauta cœlestina, Haag.

Curculionidæ.

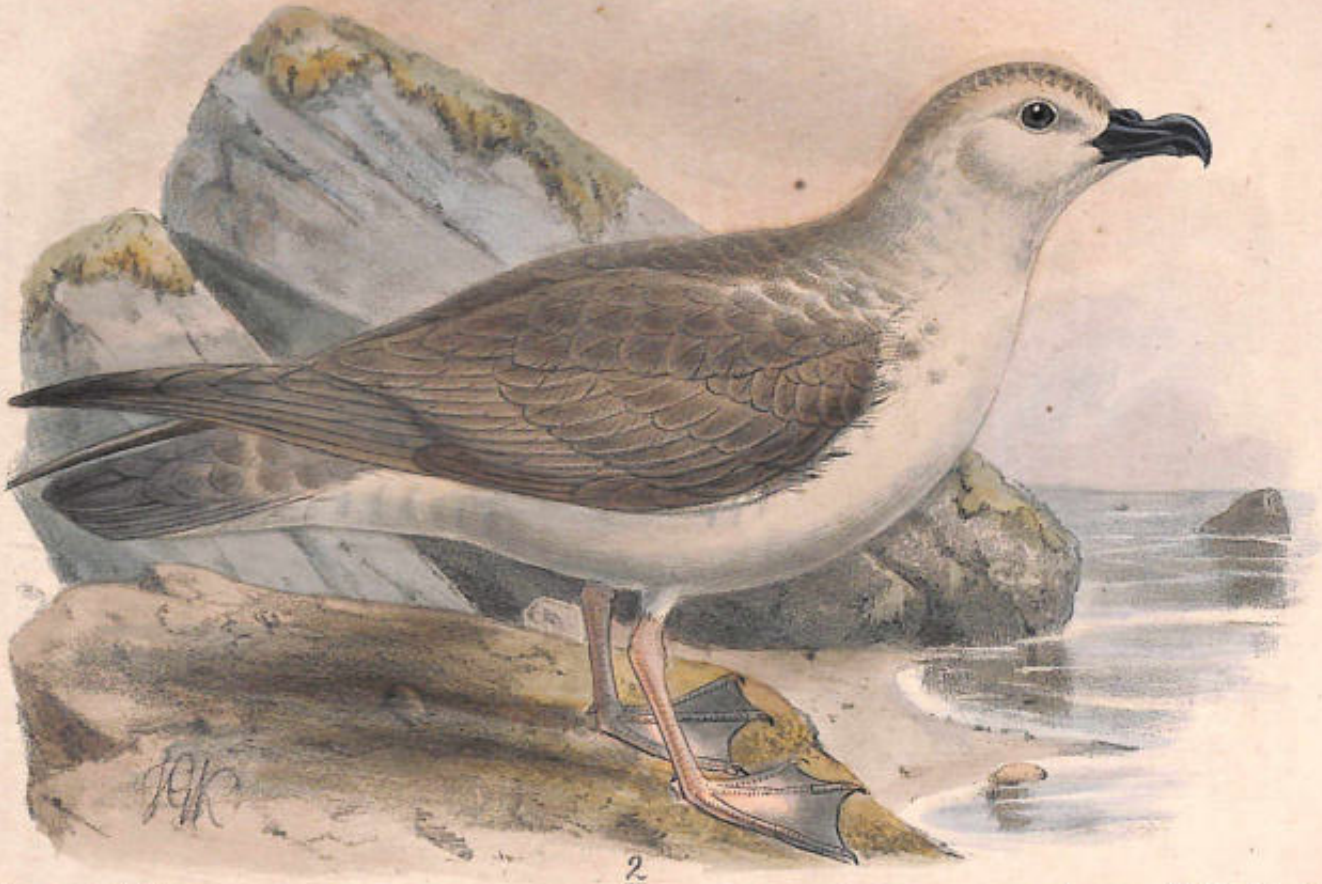
85. Blosyrus carinatus, Bohem.

Cerambycidæ.

86. Phrissoma giganteum, Guér.
87. Phryneta spinator, Fabr.
88. Apomecyna latefasciata, Qued.

Chrysomelidæ.

89. Ceralces ornata, Baly.
90. Cassida, sp.



J.G.Keulemans del. et lith.

2/5

Mintern Bros. imp.

ŒSTRELATA LEUCOPHRYS.

3. On a Collection of Petrels from the Kermadec Islands.

By Captain F. W. Hutton, F.R.S., C.M.Z.S., Curator of the Canterbury Museum, New Zealand.

[Received June 22, 1893.]

(Plate LXIII.)

Mr. T. F. Cheeseman, F.L.S., Curator of the Auckland Museum, very kindly sent me early in this year a collection of Petrels made in the Kermadec Islands at various times between 1887 and 1891, which contains examples of a species apparently new to science, and is of considerable interest in other respects. The information which I possess is, however, tantalizing, as it suggests several questions on the variation of species without giving full answers to them. These questions, which will be mentioned presently, could probably be answered if we knew with certainty (1) whether the two parents are always of the same colour; (2) whether the young bird always resembles its parents in plumage or whether there is considerable variation between parents and offspring; and (3) whether unicolour parents ever produce bicolour young or *vice versâ*.

In the descriptions which follow the length of the bill is that of the chord of the culmen, as used by Dr. Coues, and the length of the middle toe does not include the nail. It seems to me that these are the most accurate measurements that can be taken of the bill and toe.

Puffinus chlororhynchus.

P. chlororhynchus, Lesson; Salvin, Ibis, 1888, p. 352; Buller, Birds of N. Z. 2nd ed. vol. ii. p. 235.

P. sphenurus, Gould.

P. carneipes, Cheeseman (*fide* Buller), Trans. N. Z. Inst. vol. xxiii. p. 226, not of Gould.

There are five specimens in the collection, all of which are larger than those from any other locality which I can find recorded, as the following measurements will show. Length 18·5 inches, wing 12·75, tail 6·5, bill 1·65, tarsus 1·9, mid toe 2·2.

Called the "Black Burrower" by the settlers. "It arrives in the month of October in each year, often in very large numbers. It digs out burrows, often several feet in length, on the edges of the cliffs, or on the margins of inland terraces" (*Cheeseman*). I have seen no specimen of this species from New Zealand.

Puffinus tenuirostris.

P. tenuirostris, Temm.; Buller, Birds of N. Z. 2nd ed. vol. ii. p 230.

Nectris brevicaudus, Bonap.

One specimen. Length 15 inches, wing 10·75, tail 4·25, bill 1·2, tarsus 1·9, mid toe 2·1.

In addition to the slender bill and short tail, this species can be

readily distinguished by the under wing-coverts, which are greyish brown and considerably lighter than the upper wing-coverts; while in *P. chlororhynchus* the upper and lower wing-coverts are of the same tint, and in *P. griseus* (Gm.) the under wing-coverts are rather paler grey. In *P. tenuirostris* the lower mandible is said to be paler in colour than the upper, but this does not show in the dried skin.

This species is not uncommon in the North Island of New Zealand, but I have never seen a specimen from the South Island. *P. griseus*, on the contrary, is extremely abundant at Stewart Island and Foveaux Straits, and gets rare further north.

PUFFINUS ASSIMILIS.

P. assimilis, Gould; Buller, Birds of N. Z. 2nd ed. vol. ii. p. 239; Cheeseman, Trans. N. Z. Inst. vol. xxiii. p. 226.

One specimen. Length 11 inches, wing 7·5, tail 3, bill 1, tarsus 1·5, mid toe 1·5.

It seems that the Kermadec Island birds are smaller than those from New Zealand, for Sir W. Buller remarks that the bird in the British Museum obtained by Mr. John Macgillivray on Raoul Island (= Sunday Island) is somewhat smaller than the New Zealand birds, thus agreeing with the present specimen. In New Zealand this species is common in the Hauraki Gulf, but I have not seen it south of Auckland. In the south it is replaced by the larger species *P. gavia* (Forst.), which is most abundant about Cook's Strait and diminishes in numbers both to the north and to the south. Sir W. Buller, in his 'Birds of New Zealand,' 2nd ed. vol. ii. p. 236, considers the bird from the Great Barrier Island which I called *P. assimilis* (Trans. N. Z. Inst. vol. i. p. 161) to be *P. gavia*, but this is not correct. The mistake, however, is my fault, for when in my 'Catalogue of the Birds of New Zealand' (Wellington, 1872, p. 79) I showed that *P. gavia* of Forster—which had up till then been thought to be an *Œstrelata*—was a species of *Puffinus*, I confused it with *P. assimilis*, although the species appear to be distinct.

Of this species Mr. Cheeseman says that great numbers were breeding on Meyer Island in August 1887. They dig out burrows for their nests, often of considerable length.

ŒSTRELATA NIGRIPENNIS, Rothschild, Bull. Orn. Club, i. p. lvii (1893).

Œ. cookii, Cheeseman (*fide* Buller), Trans. N. Z. Inst. vol. xxiii. p. 224; not of Gray.

I have to thank Mr. O. Salvin for this determination.

Five specimens, all alike, from Kermadec and Curtis Islands. Length 12 inches, wing 9·1, tail 4·5, bill 0·9, tarsus 1·1, mid toe 1·2.

These birds are rather larger than *Œ. defilippiana*, Salvad., but they agree with it very well in colour and proportions. In New Zealand this species has been confounded with *Œ. cooki*, from

which it differs much in the stoutness of the bill and in the colours of the feet, as well as in the plumage. From *Œ. leucoptera* it differs in being lighter in colour and in the outer tail-feathers having the inner web white at the base and speckled with grey at the tip.

"Not uncommon during the summer months, arriving about the beginning of November and leaving again at the end of April. It breeds on Meyer Island and more sparingly on Sunday Island, generally in company with *P. assimilis*. It constructs a burrow sometimes over a yard in length, depositing a single pure white egg at the extremity." (*Cheeseman.*)

ŒSTRELATA CERVICALIS, Salvin, Ibis, 1891, p. 192.

Œstrelata, sp., Cheeseman, Trans. N. Z. Inst. vol. xxiii. p. 224.

Two specimens from Sunday Island, one adult, the other with down still remaining. Length 18 inches, wing 12·5, tail 6, bill 1·5, tarsus 1·6, mid toe 1·7.

Crown of the head, occiput, and below the eyes rusty black, the feathers of the posterior part of the forehead white with a black spot in the centre. Front, lores, chin, throat, malar and auricular regions, neck all round, breast, abdomen, and crissum pure white. Under wing-coverts white, with a dark patch inside the wrist-joint. Back sooty black; between the shoulders the feathers are largely tipped with grey, which gets less and less and disappears on the uropygium. The anterior part of the back is entirely grey, and this colour extends slightly on to the breast on each side, but not below the wings when folded. Some of the feathers of the flanks are tipped with grey or blackish. Upper tail-coverts brownish grey. Tail-feathers brownish grey, white at the base; the outer feathers with the inner webs white. Upper wing-coverts sooty black, the greater coverts very narrowly margined with grey. Primaries sooty black, the inner web of the first white at the base only. The wings when folded reach to about the end of the tail. Bill strong, black. Tarsi, the first and greater part of the second joint of the inner toe, the first joint of the middle toe, and the web between them yellow. Distal portion of the feet black.

Nestling.—The down still on the back of the head, back, flanks, and crissum. The colours of the plumage resemble those of the adult but are lighter. The feathers of the back are more broadly margined with light grey, as also are those of the uropygium. The upper wing-coverts, both greater and median, are margined with grey, and the feathers of the wings and tail are lighter than in the adult. On the other hand the yellow of the feet and tarsi is much darker. The measurements of the two are much the same.

I have to thank Mr. O. Salvin for identifying this bird. I have not seen his description in 'The Ibis.'

"It arrives about the end of September and remains until the end of June, being one of the last Petrels to leave the island. It is solitary in its habits, and very seldom can two nests be found in

the same locality. Its breeding-place is usually near the mountain-top, in some dark gully filled with palms and fern-trees, and generally its burrow is made at the roots of the latter. It is purely nocturnal in its habits, and rarely leaves its burrow during the daytime. An egg sent to me by Mr. Bell measured 2·5 inches in length by 1·9 in breadth, and is pure white in colour." (*Cheeseman.*)

ŒSTRELATA LEUCOPHRYS, *sp. nov.* (*Plate LXIII.*)

Œ. mollis, albino, Buller, Trans. N. Z. Inst. vol. xxiv. p. 85; not of Gould.

Two specimens from Sunday Island. Length 17 inches, wing 12, tail 5, bill 12, tarsus 1·5, mid toe 1·75.

Specimen no. 1 (*type*).—Head, neck, and whole of the under surface pure white, the feathers of the front and crown with very pale brown centres. Back, uropygium, tail, and all the upper surface of the wings pale ashy brown. Under surface of the wings white, the axillary feathers tinged with ash-grey towards the tips, as also are the outer under tail-coverts. Primaries brownish ash, the inner web white, which colour extends nearer to the tip than in *Œ. neglecta*. Outer tail-feathers with the inner web white at the base only. Bill black. Tarsus, inner toe, first and half the second joint of the middle toe, first joint of the outer toe, and the web between them, pale; the distal portion of the foot black.

Specimen no. 2 (*young*?).—Like the last, but darker. Back, uropygium, tail, and upper surface of wings dark brown; under wing-coverts and axillary feathers brown. Feet with the first joint only of all the toes, and the web between them, pale; the rest black.

In both specimens the wings, when folded, reach to about the end of the tail. The dark colour of the feet makes me think that the darker-coloured bird is the younger of the two. Judging from the general colour of the plumage it may possibly be the same as *P. alba* of Gmelin, of which I have not the original description; but that name has been applied to so many different species as to lead me to believe that the description is very vague, and if so the name had better be dropped. It differs from *Œ. lessoni* in not having a black band through the eye. It was thought by Sir W. Buller to be a variety of the next species; but, in addition to its colours, it is easily distinguished by the white on the inner webs of the primaries, by its larger size, and by the wings not reaching beyond the tail. The type is in the Auckland Museum.

Mr. Bell, who lived on Sunday Island and collected many of the birds, told Mr. Cheeseman that he had seen very few individuals of this species, but that they had the same breeding-habits as the Kermadec Mutton-birds (*Œ. incerta*) and consorted with them.

ŒSTRELATA NEGLECTA.

Procellaria neglecta, Schlegel.
Œ. neglecta, Coues, Proc. Phil. Acad. 1866, p. 170.

Œ. mollis, Cheeseman (*fide* Buller), Trans. N. Z. Inst. vol. xxiii. p. 225; Buller, Trans. N. Z. Inst. vol. xxiv. p. 85; not of Gould.

Two adults and one nestling from Sunday Island. Length 15·5 inches, wing 11·75, tail 4·5, bill 1·2, tarsus 1·5, mid toe 1·7.

Forehead, top of the head, neck, and breast pale greyish brown, the feathers of the forehead with a darker middle spot. A patch in front of and below the eye, as well as a streak below the mandible, darker. Lores, chin, throat, and abdomen white. Back, upper surface of wings, and tail dark brown. Under surface of wings, flanks, and under tail-coverts greyish brown. Crissum white washed with grey. Primaries dark brown, the inner web white, this colour not reaching so near the tip as in *Œ. leucophrys*, and being narrowly pointed distally, and not reaching the shaft for some distance down. Bill black. Tarsi, first joint of inner and middle toes, and the webs between them pale; the distal portion of the feet black. The wings when folded extend about an inch beyond the tail.

Nestling.—Sunday Island, Nov. 1890. The down is still on the axillary and flank feathers and the primaries are not fully grown, not reaching within an inch of the end of the tail. The bill and feet are as large as in the adult. The colours generally are those of the adult, but the lores are grey, the feathers of the forehead have no dark central spot, and the tint of the breast is greyer. The legs and feet are much the same as in the adult. It is possible that this may be the young of the next species.

In both specimens the line of junction of the feathers with the base of the bill descends perpendicularly from the base of the nasal tubes nearly to the commissure and then suddenly turns backward.

This bird was considered by Sir W. Buller to be *Œ. mollis*, but that species is smaller, has the whole of the inner web of the primaries dark, and the outer tail-feathers white speckled with grey. I doubt whether *Œ. mollis* has ever been found in the New Zealand seas. Dr. Finsch certainly identified a bird taken by the 'Novara' Expedition as *Œ. mollis*, but as he also considered *Œ. affinis* (Buller) to be the same, it is evident that, at the time, he did not know the true *mollis*. *Œ. affinis* has the inner half only of the inner web of the primaries white, and it has been identified by Mr. O. Salvin with *Œ. gularis* (Peale). It seems to me that *Procellaria inexpectata* (Forster) is the same, although it has been identified with *Œ. mollis* by Dr. R. Bowdler Sharpe.

Mr. Cheeseman informs me that *Œ. neglecta* is certainly the winter Mutton-bird of the Kermadec settlers, which is said to breed only on Meyer Island and other outlying rocks during the winter months, the young being ready to depart when the true Mutton-birds arrive at the end of August. Mr. Cheeseman says that at the time of his visit (August 1887) the slopes of Meyer Island were crowded with nearly full-grown fledglings sitting at the roots of the trees. At his approach they uttered hoarse cries and endeavoured to escape by rolling down the hill, the old birds circling

about among the trees above his head. The true Mutton-bird had not yet commenced to lay. Mr. Cheeseman also informs me that none of the young birds were dark-coloured, but closely resembled the old ones in plumage. Mr. Bell says that the winter Mutton-bird breeds from May to September and that its egg is rather larger and rounder than that of the true Kermadec Mutton-bird.

As all the specimens sent to me were labelled Sunday Island, the species must occur there too, and some of them may breed later with the next variety, which is the summer Mutton-bird. Indeed this must be the case if the nestling just described really belongs to *Œ. neglecta*.

ŒSTRELATA NEGLECTA, variety.

One adult from Sunday Island, August 1888. Length 15·5 inches, wing 11·25, tail 4·5, bill 1·2, tarsus 1·5, mid toe 1·8.

The whole of the head, neck, breast, and flanks brownish grey; darker on the back, wings, and tail. Abdomen and crissum white. Under wing-coverts brownish grey. Bill, legs, and feet as in *Œ. neglecta*. The wings when folded extend about an inch beyond the tail.

This variety is very closely allied to the typical *Œ. neglecta*; but, in addition to the colours, it may be distinguished from it by the contour of the line of junction of the feathers with the base of the bill, which runs from the base of the nasal tubes obliquely backward to the gape, and does not descend as in the typical *Œ. neglecta*. If this character is constant there can be no hesitation in admitting it as an incipient species; but, unfortunately, I have only one specimen.

This variety appears to be the true Mutton-bird of the settlers, which is said "to arrive in immense numbers at the end of August or early in September, and to breed all over the main island, but most abundantly towards the tops of the hills. Unlike most of the other Petrels it makes no burrow, but lays its single egg in a hollow at the root of a tree or even anywhere on the bare ground" (*Cheeseman*). However, it would seem, as already mentioned, that some individuals of the typical form also breed on the main island in September with the variety, for Mr. Bell sent skins of both kinds to Mr. Cheeseman, who understood him to say that both belonged to the summer Mutton-birds; but as he also sent at the same time specimens of *Œ. phillipi*, there is considerable doubt as to what he meant. Mr. Cheeseman himself says, "I find but little difference between the two kinds (winter and summer Mutton-birds), save that this (winter Mutton-bird) has a more distinct dark band across the breast."

It seems probable that we have here a very interesting example of the evolution of a new species by isolation due to an alteration in the time of breeding of certain individuals of *Œ. neglecta*. This seems to be a better explanation of the facts, as they are at present known, than the supposition that we have here merely individual

variations; for it seems to be certain that no individuals of the variety occur on Meyer Island when the winter Mutton-bird is breeding.

ŒSTRELATA PHILLIPI, Gray.

Norfolk Island Petrel, Phillip's Voyage to Botany Bay, p. 161 (London, 1789).

Procellaria phillipii, G. R. Gray, Ibis, 1862, p. 246.

Œ. mollis, dark variety, Buller, Trans. N. Z. Inst. vol. xxiv. p. 85.

Three specimens from Sunday Island. Length 16 inches, wing 11·5, tail 4·75, bill 1·2, tarsus 1·5, mid toe 1·8.

Upper surface sooty black, the feathers on the forehead and on the back (in one specimen only) margined with brown. Under surface grey, washed with brown on the abdomen. Sometimes some light feathers on the lores and chin, and a dark mark in front of the eye. Bases of all the contour feathers white. Primaries white on the inner webs for the greater part of their length, the white terminating bluntly and reaching the shaft some distance outside of the tips of the lower wing-coverts. Outer tail-feathers brown, with white at the inner bases only. Bill black. Tarsi, first joint of inner and middle toes, and the web between them, brownish; the distal parts of the foot black. The wings when folded exceed the tail by more than an inch.

I have little doubt but that this bird is the same species as the Norfolk Island Petrel of Governor Phillips. It approaches the last species, but can be distinguished by the shape of the white on the inner web of the primaries as well as by its colours. Having examined three specimens which, although varying slightly in colour, are constant in this respect, I have no hesitation in admitting it as distinct.

It is this bird, probably, when flying on the New Zealand coast, that I formerly mistook for *Pterodroma atlantica* (Gould)[1], of which there is no authentic record of its having been taken near New Zealand.

Mr. Cheeseman informs me that he did not see this species at the Kermadecs and knows nothing about its breeding-habits; but that Mr. Bell sent him specimens with the summer Mutton-birds, so that it probably breeds with them from September to November. The Norfolk Island Petrel is said to form burrows in the sand.

It is a remarkable fact that in the genus *Œstrelata* there are three bicolour species each closely related to a unicolour species—viz. *Œ. neglecta* to *Œ. solandri*, *Œ. armingoniana* to *Œ. trinitatis*, and *Œ. mollis* to *Œ. brevirostris*—the two forms appearing in all three cases to breed near together on the same islands. I am not aware of the same thing occurring in any other genus of

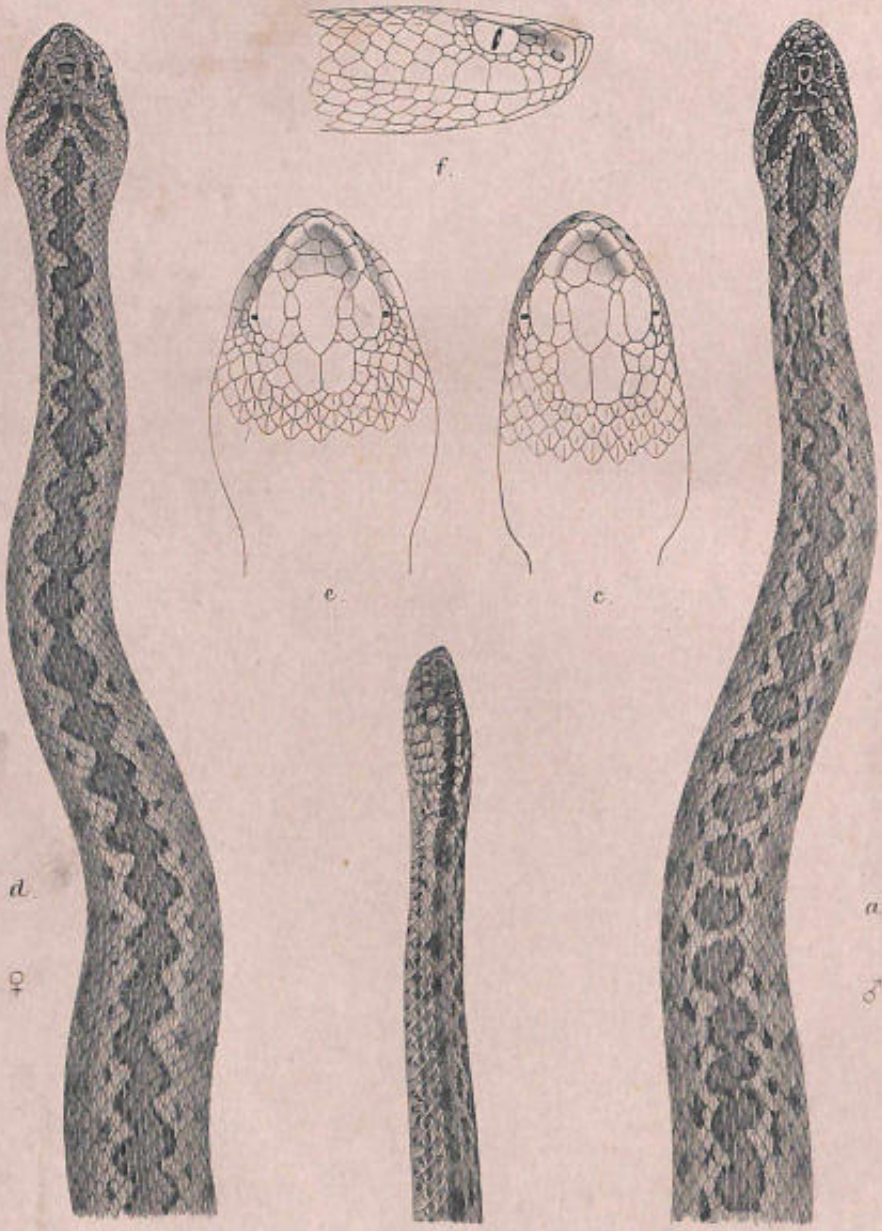
[1] This species has been identified with *Procellaria fuliginosa*, Forster, but it is not the *Œstrelata fuliginosa* of Buller's 'Birds of New Zealand,' which appears to be the larger species *Pterodroma macroptera* (Smith).

Petrels unless it be the somewhat similar relation in colour between *Diomedea regia* and *Diomedea exulans*; but these two closely related species are said to breed on different islands and at slightly different times[1]. Macgillivray was the first to call attention to this peculiarity in the birds of the Kermadec Islands (Zoologist, 1860, p. 7133), where he found incubating birds in both phases of plumage. More recently Mr. Osbert Salvin has discussed the question in Rowley's 'Ornithological Miscellany,' vol. i. p. 254. He says that the colouring is not dependent either on sex or on age, and that the colouring of the first plumage is retained through life, both of which statements the present paper tends to confirm. He considers, however, that the two phases of plumage do not indicate different species, or even different varieties, but he thinks they are probably due to a kind of dimorphism. The word dimorphism has been used in zoology in several different senses, but it always denotes that the two forms are related to each other either as twin brothers and sisters, or else that there is an alternation of generations between them. As Petrels lay only one egg in a season, the first relation cannot hold here, so that—if it is really a case of dimorphism—eggs laid by bicolour parents should sometimes hatch out unicolour offspring and *vice versâ*, of which there is no evidence at present. Also, if it be truly a case of dimorphism, there ought to be no intermediate varieties between the two forms, whereas these intermediate varieties seem to be sufficiently common to have led some ornithologists to the opinion that the two forms are merely adult and young of the same species. If we reject the idea of dimorphism as improbable, and that of changes due to age as disproved, we have three different hypotheses to choose from to explain the facts:—

1. Two distinct species, sometimes producing hybrids.
2. One excessively variable species, one form producing, or partially producing in an irregular way, the other.
3. Two species developed by ordinary variation going on for a long time, while the intermediate forms have not become extinct.

An examination of the breeding-ground would probably enable us to decide which of these hypotheses is the correct one. If the first is correct, the young should always either closely resemble the parents, or be a distinct hybrid two parents of which had different styles of plumage. If the second is correct, then any variety might produce any other and the offspring should generally be different from the parents. While if it be the third hypothesis which is true, then each form should produce young very like themselves, and the two parents should always resemble each other. For my part I strongly incline to the last hypothesis, which is more in accordance with what we know in other cases

[1] Buller, Trans. N. Z. Inst. vol. xxiii. p. 230 and vol. xxiv. p. 68.



R. Mintern & J. G. del. et lith.

Mintern. Bros. imp.

VIPERA RENARDI.

and, as I think, offers the best explanation of the facts as at present known. For I cannot but think that *Œ. neglecta* and *Œ. phillipi* are two closely related species, while *Œ. neglecta*, var., is an incipient species which, perhaps, does not always breed quite true. It seems to me that we have in the Kermadec Islands a manufactory of species in full swing, but unfortunately our information is not sufficient to tell us exactly by what process the species are made.

4. On *Vipera renardi*, Christoph. By G. A. Boulenger.

[Received November 25, 1893.]

(Plate LXIV.)

When recently describing *Vipera ursinii*, Bonap.[1], I briefly alluded to another European species, *V. renardi*, described in 1861, but since forgotten or confounded with *V. berus*. My friend Dr. F. Müller, of Basle, having been so good as to send me specimens from Sarepta, the original locality whence the species was described by Christoph, and the British Museum having received further specimens from the St. Petersburg Museum, through the kindness of Dr. Herzenstein, I have no reason to further delay the description of this species, of which I have now 17 specimens before me, viz.:—

1, 2. ♂ & ♀, from Sarepta, received from Dr. F. Müller, one of which he has allowed me to retain for the British Museum.
3. ♂, from Saratov, received from the St. Petersburg Museum.
4. ♂, from Ourkatsch, district of Tourgaisk, Kirghiz Steppes, received from M. Nazarow.
5. ♂, from the River Emba, Kirghiz Steppes, received, as well as the following, from the St. Petersburg Museum.
6. Young, from the Kirghiz Steppes.
7. ♂, from Smeinogorsk, Government of Tomsk.
8–12. Five specimens, ♂, ♀, and young, from Chinas, Turkestan.
13. Young, from Kunges, River Ili, Eastern Turkestan.
14, 15. ♂ & ♀, Wernensky Ujesd, district of Varnoe, Eastern Turkestan.
16, 17. ♂, from Kuldja, Eastern Turkestan.

[1] In the last part of these 'Proceedings,' above, p. 596. Since my note appeared I have received further information respecting that species. First, Mr. A. Erwin Brown has kindly examined Bonaparte's type specimen in Philadelphia, and the notes he has forwarded me substantiate my conclusions. Secondly, I have been able to extend the known range of this Viper to France, having received a specimen from the Basses-Alpes, through M. Honnorat, on which I have reported in the 'Feuille des Jeunes Naturalistes,' xxiv. 1893, p. 8. And lastly, I am informed by Prof. O. Boettger and Dr. F. Werner that they have received specimens from the mountains of Bosnia, which agree in all essential respects with those from Laxenburg.

VIPERA RENARDI. (Plate LXIV.)

Pelias renardi, Christoph, Bull. Mosc. xxxiv. 1861, ii. p. 599.

Vipera berus, part., Strauch, Syn. Viper. p. 32 (1869); and Schl. Russ. R. p. 206 (1873).

Vipera renardi, Bouleng. Proc. Zool. Soc. 1893, p. 598.

Snout obtusely pointed, as in *V. ursinii*; canthus rostralis angular and raised, the upper surface of the snout thereby concave. Horizontal diameter of the eye equal to its distance from the centre or the anterior border of the nostril; its vertical diameter equal to or a little less than its distance from the oral border. Nostril pierced in the lower half of the nasal shield, which is not larger than the eye. The three sincipital shields usually well developed; in two specimens (from Chinas and Kunges) the parietals are broken up into scales, and in a third (from Kuldja) the frontal is besides small and irregular, being separated from the right supraocular by two series of scales; it is therefore probable that, as in *V. berus*, specimens will be found with the vertex covered with small scales. But when the shields are well developed they differ from those of *V. berus* and agree better with those of *V. ursinii*. The frontal is once and two-thirds to twice and one-third as long as broad, usually longer than the parietals; its length at least equals, usually exceeds, its distance from the end of the snout; it is separated from the supraocular by an elongate shield or by two or three small shields. The rostral is as broad as deep or a little deeper than broad and its tip is in contact with a single apical shield, which, together with the two canthals on each side, forms the raised upper border of the snout; two to six præfrontal scales within the latter; the upper præocular is usually in contact with the nasal; either a single series of scales between the eye and the labials, or two series except under the centre of the eye, which is separated from the fourth labial by a single scale; nine or ten upper labials, fourth or fourth and fifth below the eye; nine or ten (in one specimen eleven) scales round the eye.

The scales on the body form 21 longitudinal series, exceptionally 19, as in *V. berus*, strongly keeled, the outer smooth or feebly keeled. According to the numbers given by Strauch (Schl. Russ. R. p. 279, specs. 1019–1027), the ventrals vary from 138 to 150, the subcaudals from 27 to 34. Christoph describes the male as with 141 ventrals and 36 subcaudals, the female with 139 ventrals and 34 subcaudals. My specimens have 130 to 148 ventrals and 31 to 36 subcaudals in the males, 137 to 142 ventrals and 24 to 30 subcaudals in the females [1], as shown in the following table:—

[1] (P.S. 23-1-94).—I have now counted the shields in 52 specimens (15 ♂, 37 ♀) of *V. ursinii*, and 118 (56 ♂, 62 ♀) of *V. berus*. The variation in the former species is 120–135 v., 30–37 c. in ♂, 125–142 v., 20–28 c. in ♀; in the latter, 134–150 v., 33–46 c. in ♂, 135–158 v., 26–36 c. in ♀.—G. A. B.

Sex.	Locality.	Total length.	Length of tail.	Scales.	Ventrals.	Caudals.
♂	Ourkatsch.	585 millim.	70 millim.	21	144	35
,,	Chinas.	460 ,,	55 ,,	21	136	32
,,	Sarepta.	450 ,,	55 ,,	21	142	34
,,	Saratov.	450 ,,	60 ,,	21	142	36
,,	Emba.	420 ,,	50 ,,	21	148	36
,,	Smeinogorsk.	420 ,,	55 ,,	21	142	35
,,	Chinas.	400 ,,	50 ,,	21	137	36
,,	Kuldja.	370 ,,	50 ,,	21	133	34
,,	Varnoe.	320 ,,	43 ,,	21	134	31
,,	Kuldja.	300 ,,	40 ,,	21	138	32
,,	Kirghiz.	245 ,,	32 ,,	21	145	35
,,	Chinas.	180 ,,	24 ,,	21	130	36
♀	Varnoe.	395 ,,	40 ,,	21	141	27
,,	Sarepta.	380 ,,	32 ,,	21	142	24
,,	Chinas.	350 ,,	37 ,,	21	137	30
,,	,,	175 ,,	20 ,,	21	139	30
,,	Kunges.	175 ,,	22 ,,	19	130	30

The length of the tail is contained $7\frac{1}{2}$ to $8\frac{1}{2}$ times in the total in males, 8 to 10 times in females.

One of the principal characters which induced Christoph to separate this Snake from *V. berus* is the absence of sexual differences of colour, a peculiarity which it shares with *V. ursinii*. The same author further observes that the sinuous or zigzag dorsal band is nearly always broken up into spots, at least on a considerable portion of the body. The latter statement is verified on the male from Sarepta before me, but the female, on the other hand, has an uninterrupted zigzag band. Strauch (Syn. Viper. p. 37) also observes:—"Although it is now well known that the numerous colour-varieties of this Snake [*V. berus*] are by no means restricted to particular localities, and therefore cannot be regarded as geographical races, I must nevertheless remark that most of the Transcaspian specimens before me are very light, almost sand-coloured, and usually have a longitudinal row of roundish or transverse light chestnut-brown blotches instead of the dorsal band."

In coloration the Sarepta specimens are very similar to *V. ursinii*, but they differ in having the labial shields markedly dark-edged. The dorsal band or series of spots is dark brown, edged with blackish; the ground-colour of the middle of the back and of the scales of the two outer rows on each side is yellowish, of the sides (four rows of scales) greyish-brown with two series of dark brown spots; the markings on the head as in *V. berus* and *V. ursinii*. The lower parts are whitish or pale greyish, with blackish dots, of which there is a series of larger ones along each side of the belly.

The specimens from Chinas and the Kirghiz Steppes agree with Strauch's description in being of a pale yellowish sand-colour, with a brown, darker-edged dorsal zigzag band or series of spots and

two series of small spots on the sides; belly whitish, dotted or spotted with black. Those from Varnoe are intermediate between the latter and the Sarepta ones; whilst two specimens, both males, from Saratov and Smeinogorsk are dark brown above with a darker zigzag band, the one from the latter locality being further remarkable in having the underparts uniform blackish, as in *V. berus*. In all the specimens examined by me the labials and the rostral are spotted, speckled, or margined with black or brown; a well-marked dark postocular streak, extending or not to the side of the neck, and one or two Λ-shaped markings on the back of the head are present. The tip of the tail is never yellow.

Christoph found *V. renardi* common in the bare steppe around Sarepta; only on one occasion did he come across a specimen in a locality overgrown with willows and small shrubs. The following sketch of its distribution is taken from Strauch's 'Synopsis der Viperiden,' p. 53:—

"The Viper occurs also in the district of Uralsk, apparently in abundance, as our collection has received, through Count A. Keyserling, numerous examples from the vicinity of that town; and it is, according to Becker (Bull. Mosc. 1855, i. p. 473), very common in the steppe around Sarepta, where Christoph obtained the variety described by him as *Pelias renardi*. . . . . The first record of its occurrence in the Kirghiz Steppes we owe to the elder Gmelin (Reise d. Sibir. iv. p. 318), who met with great numbers on the Tschebarkul Lake, in the little Kirghiz Horde; it was afterwards found in the Emba Steppes by the late Dr. Lehmann, and in the steppes between the Emba and Temir by Dr. Moritz; more recently a specimen was captured by Dr. Severzow on the Issembai, an affluent of the Ilek. We know nothing of its occurrence in the Middle Kirghiz, but numerous specimens were caught about 1840 by Dr. v. Schrenck in the steppes near the Alatau, on the borders of the Urdshar, and in Tarbagatai, in the Semipolatinsk district, whence Pallas (Reise, ii. p. 493) recorded it from the Semijarskaja Stanija."

In concluding I beg to express my thanks to Dr. Herzenstein and Dr. F. Müller for their assistance in procuring the material on which these notes are based.

EXPLANATION OF PLATE LXIV.

Vipera renardi, from Sarepta. *a–c*. Male. *d–f*. Female.

APPENDIX.

LIST OF ADDITIONS TO THE SOCIETY'S MENAGERIE

DURING THE YEAR

1893.

Jan. 2. 2 Barbary Mice (*Mus barbarus*). Presented by Lord Lilford, F.Z.S.
3. 4 Bearded Titmice (*Panurus biarmicus*), 2♂, 2♀. Purchased.
4 Anis (*Crotophaga ani*). Purchased.
4. 6 Hog-nosed Snakes (*Heterodon platyrhinos*). Purchased.
1 Striped Snake (*Tropidonotus sirtalis*). Purchased.
1 Pied Snake (*Pituophis melanoleucus*). Purchased.
6. 1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by Mr. W. Stutely.
10. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by Mr. F. Skinner.
11 Tuatera Lizards (*Sphenodon punctatus*). From Stephen's Island, Cook's Strait, New Zealand. Presented by Capt. E. A. Findlay (Lieut. R.N.R.).
1 Vulpine Phalanger (*Phalangista vulpina*), ♀. Presented by G. S. Streeter, Esq.
1 Stanleyan Chevrotain (*Tragulus stanleyanus*), ♂. Deposited.
1 Sanderling (*Calidris arenaria*). Purchased.
11. 1 Puff-Adder (*Vipera arietans*). Presented by the Court of Directors of the British E. Africa Co.
12. 1 Hog-Deer (*Cervus porcinus*), ♂. Born in the Menagerie.
14. 2 Brown Capuchins (*Cebus fatuellus*), ♂ ♀. Purchased.
1 Azara's Fox (*Canis azaræ*). Purchased.
7 White-faced Ibises (*Plegadis guarauna*). Purchased.
1 Brown Milvago (*Milvago chimango*). Purchased.
4 Barn-Owls (*Strix flammea*). Purchased.
1 Ypecaha Rail (*Aramides ypecaha*). Purchased.
1 Chilian Pintail (*Dafila spinicauda*). Purchased.
1 Geoffroy's Terrapin (*Platemys geoffroyana*). Purchased.
1 Ring-tailed Coati (*Nasua rufa*), ♂. Deposited.
16. 1 Straw-necked Ibis (*Carphibis spinicollis*). Purchased.
17. 1 Meadow-Bunting (*Emberiza cia*), ♂. Received in Exchange.
2 Shaw's Gerbilles (*Gerbillus shawi*). Born in the Menagerie.
2 Tuatera Lizards (*Sphenodon punctatus*). Presented by Mr. W. H. Purvis.

Jan. 19. 1 Triton Cockatoo (*Cacatua triton*). Presented by Arthur Harter, Esq.
20. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by A. Sandbach, Esq.
6 Wild Ducks (*Anas boschas*), 3♂, 3♀. Purchased.
1 Gannet (*Sula bassana*). Presented by F. W. Ward, Esq.
21. 2 Wanderoo Monkeys (*Macacus silenus*), ♂ ♀. Purchased.
4 Snow-Buntings (*Plectrophanes nivalis*). Purchased.
23. 2 Mouflons (*Ovis musimon*), ♂ ♀. Received in Exchange.
25. 1 Virginian Eagle-Owl (*Bubo virginianus*). Deposited.
1 Rough Terrapin (*Clemmys punctularia*). From Guiana. Presented by J. J. Quelch, Esq., C.M.Z.S.
26. 7 Azara's Opossum (*Didelphys azaræ*), ♀ et jv. From the Argentine Republic. Presented by Mr. Hill.
28. 1 American Milk-Snake (*Coluber eximius*). From Tennessee. Presented by Miss Winifred M. Middleton.
30. 1 Æthiopian Wart-Hog (*Phacochœrus æthiopicus*), ♂. From Matabeleland, S. Africa. Presented by B. B. Weil, Esq., F.Z.S.
1 Two-spotted Paradoxure (*Nandinia binotata*). Presented by Lady Fleming.
14 Prairie Marmots (*Cynomys ludovicianus*), 6♂, 8♀. Purchased.

Feb. 1. 1 Grey Parrot (*Psittacus erithacus*). Presented by the Executor of the late Mrs. Bolaffe.
2 Rufous Tinamous (*Rhynchotus rufescens*). Purchased.
5 Tuatera Lizards (*Sphenodon punctatus*). Purchased.
2. 1 Red-and-Yellow Macaw (*Ara chloroptera*). Presented by H. H. Dobree, Esq.
3. 1 Brush-tailed Kangaroo (*Petrogale penicillata*), ♂. Presented by Wilberforce Bryant, Esq.
2 Black-striped Wallabies (*Halmaturus dorsalis*), 2♀. Presented by Wilberforce Bryant, Esq.
3 Great Cyclodus (*Cyclodus gigas*). Received in Exchange.
3 Diamond Snakes (*Morelia spilotes*). Received in Exchange.
1 Short Death-Adder (*Hoplocephalus curtus*). Received in Exchange.
1 Purple Death-Adder (*Pseudechis porphyriaca*). Received in Exchange.
1 North-Australian Banded Snake (*Pseudonaia nuchalis*). Received in Exchange.
1 Arctic Fox (*Canis lagopus*). Purchased.
4. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by Capt. U. Cooke.
1 Maugé's Dasyure (*Dasyurus maugæi*). Presented by Robert Hoare, Esq.
2 Chukar Partridges (*Caccabis chukar*), ♂ ♀. Presented by Major Ingoldsby Smythe.
6. 3 European Pond-Tortoises (*Emys europæa*). Deposited.
7. 1 Great Eagle-Owl (*Bubo maximus*). Presented by Adolphus Brucker, Esq.
1 Egyptian Cobra (*Naia haje*). From Victoria West, Cape Colony. Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
2 Hoary Snakes (*Coronella cana*). From Victoria West, Cape Colony. Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
9. 9 Snow-Buntings (*Plectrophanes nivalis*). Presented by Mr. T. E. Gunn.

Feb. 10. 1 Fallow Deer (*Dama vulgaris*), ♂. Presented by B. L. Rose, Esq.
2 Gold Pheasants (*Thaumalea picta*), 2♀. Presented by Miss Forster.
12. 1 King Snake (*Coluber getulus*). Received in Exchange.
14. 1 Vervet Monkey (*Cercopithecus lalandii*), ♂. Presented by Walter Neall, Esq.
2 Red-and-Yellow Macaws (*Ara chloroptera*). Presented by Henry Goschen, Esq.
2 Whooper Swans (*Cygnus musicus*). Purchased.
15. 4 Barbary Mice (*Mus barbarus*). Born in the Menagerie.
16. 1 Herring-Gull (*Larus argentatus*). Presented by W. R. Galbraith, Esq.
1 Bar-breasted Finch (*Munia nisoria*). Presented by S. D. Birch, Esq.
1 Vulpine Phalanger (*Phalangista vulpina*), ♀. Born in the Menagerie.
20. 2 Herring-Gulls (*Larus argentatus*). Presented by J. S. Williams, Esq.
21. 1 Ariel Toucan (*Ramphastos ariel*). Presented by Ellis Edwards, Esq.
22. 1 Great Eagle-Owl (*Bubo maximus*). From the Lower Danube. Presented by Commander E. G. Rason, R.N.
2 Spengler's Terrapins (*Nicoria spengleri*), ♂ ♀. From Okinawa Shima, Loochoo Islands. Presented by P. Aug. Holst, Esq. See P. Z. S. 1893, p. 237.
23. 2 Tuatera Lizards (*Sphenodon punctatus*). Presented by Capt. Worster.
1 Spiny-tailed Mastigure (*Uromastix acanthinurus*). From Biskra, Algeria. Presented by Miss Rigby.
24. 1 Mozambique Monkey (*Cercopithecus pygerythrus*), ♂. From Mombasa, E. Africa. Presented by R. Hughes, Esq.
1 Cuming's Octodon (*Octodon cumingi*), ♂. Deposited.
25. 1 Bonnet-Monkey (*Macacus sinicus*), ♀. Presented by W. Yeoman, Esq.
26. 1 Eland (*Oreas canna*), ♂. Born in the Menagerie.
27. 1 Black-faced Spider-Monkey (*Ateles ater*). Presented by Miss Gertrude Farman.
28. 1 Naked-footed Owlet (*Athene noctua*). From Switzerland. Presented by Albert Stevens, Esq.

Mar. 1. 1 Four-horned Antelope (*Tetraceros quadricornis*), ♂. Purchased.
6 Indian Wild Swine (*Sus cristatus*). Born in the Menagerie.
2 Badgers (*Meles taxus*). Born in the Menagerie.
3. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Mrs. Frank Phillips.
6. 1 Grey Plover (*Squatarola helvetica*). Purchased.
7. 3 White-tailed Gnus (*Connochætes gnu*), 1 ♂, 2♀. Purchased. See P. Z. S. 1893, p. 325.
1 Spotted Ichneumon (*Herpestes nepalensis*). Presented by Philip Egerton, Esq., Lieut. R.N.
1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Presented by Miss Amy M. Dundas.
1 Salvin's Amazon (*Chrysotis salvini*). Purchased.
8. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by G. J. Sheppard, Esq.

Mar. 8. 1 Black Tanager (*Tachyphonus melaleucus*). Presented by Miss Trelawney.
4 Magellanic Geese (*Bernicla magellanica*), 4 ♂. Received in Exchange.
9. 1 Leopard (*Felis pardus*), ♂. From Kismayu, E. Africa. Presented by J. Rose Todd, Esq.
6 Vulturine Guinea-Fowls (*Numida vulturina*). Presented by R. J. D. MacAllister, Esq.
1 Side-striped Squirrel (*Tamias lateralis*). Presented by Mr. A. N. Pacey.
4 Coypus (*Myopotamus coypus*). Born in the Menagerie.
10. 1 Burchell's Zebra (*Equus burchelli*), ♀. Purchased.
11. 1 Long-fronted Gerbille (*Gerbillus longifrons*), ♀. Presented by Allen D. Graham, Esq.
13. 3 Barbary Mice (*Mus barbarus*). Born in the Menagerie.
4 Shaw's Gerbilles (*Gerbillus longifrons*). Born in the Menagerie.
14. 1 Magellanic Goose (*Bernicla magellanica*), ♀. Received in Exchange.
1 Stanley Parrakeet (*Platycercus icterotis*). Deposited.
16. 11 Orbicular Horned Lizards (*Phrynosoma orbiculare*). From San Diego, California. Presented by Willson Chamberlain, Esq.
18. 1 Wandering Albatross (*Diomedea exulans*). Captured at sea, off Cape Horn. Purchased.
19. 1 Mouflon (*Ovis musimon*), ♂. Bred in the Menagerie.
21. 3 Common Peafowls (*Pavo cristatus*), 2 ♂, 1 ♀. Presented by W. Murphy Grimshaw, Esq.
22. 1 Double-banded Sand-Grouse (*Pterocles bicinctus*), ♂. Presented by H. H. Sharland, Esq., F.Z.S.
23. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Mr. J. W. Jones.
1 Hog-Deer (*Cervus porcinus*), ♂. Born in the Menagerie.
1 Hawfinch (*Coccothraustes vulgaris*), ♂. Purchased.
4 Bramblings (*Fringilla montifringilla*). Purchased.
24. 1 Mozambique Monkey (*Cercopithecus pygerythrus*), ♂. From Zanzibar. Presented by C. E. Reynolds, jr., Esq.
10 Guppy's Cyprinodons (*Giradinus guppyi*). From Trinidad. Presented by the Marquis of Hamilton.
26. 1 Copyu (*Myopotamus coypus*). Presented by Arthur Hunt, Esq.
27. 3 Rhomb-marked Snakes (*Psammophylax rhombeatus*). Presented by Messrs. H. M. & C. Beddington.
1 Hoary Snake (*Coronella cana*, jr.). Presented by Messrs. H. M. & C. Beddington.
28. 2 Silver-backed Foxes (*Canis chama*). Purchased.
1 Cape Bucephalus (*Bucephalus capensis*). Purchased.
1 Bonnet-Monkey (*Macacus sinicus*), ♂. Presented by J. Pitcher, Esq.
29. 3 Common Peafowls (*Pavo cristatus*), 1 ♂, 2 ♀. Presented by T. Guy Paget, Esq.
1 Bengalese Cat (*Felis bengalensis*). From Manila, Philippine Islands. Presented by D. M. Forbes, Esq., F.Z.S.
1 Leadbeater's Cockatoo (*Cacatua leadbeateri*). Presented by Mrs. W. Everett Smith.
30. 3 Spring-boks (*Gazella euchore*). Deposited by H.R.H. The Prince of Wales. See P. Z. S. 1893, p. 325.

Mar. 30. 1 Green Monkey (*Cercopithecus callitrichus*). Deposited.
1 Raccoon (*Procyon lotor*). Deposited.
1 Puma (*Felis concolor*) ♂. Purchased.
5 Black-headed Gulls (*Larus ridibundus*). Presented by the Rev. E. Mitchell.
1 Common Gull (*Larus canus*). Presented by the Rev. E. Mitchell.

April 1. 1 Short Death-Adder (*Hoplocephalus curtus*). Received in Exchange.
4 Great Cyclodus (*Cyclodus gigas*). Born in the Menagerie.
4. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Deposited.
1 Bell's Cinixys (*Cinixys belliana*). Purchased.
1 Home's Cinixys (*Cinixys homeana*). Purchased.
5. 2 Black Rats (*Mus rattus*). Presented by Sydney Wedlock, Esq.
6. 1 Leopard (*Felis pardus*). From India. Presented by Admiral W. R. Kennedy, R.N., F.Z.S.
3 Coypus (*Myopotamus coypus*). Born in the Menagerie.
1 Ornamented Tree-Snake (*Chrysopelea ornata*). Presented by Mr. W. Jamrach.
7. 1 Yellow-fronted Amazon (*Chrysotis ochrocephala*). From British Guiana. Presented by Mrs. Mackey.
1 Mute Swan (*Cygnus olor*), ♀. Received in Exchange.
1 Common Pintail (*Dafila acuta*). Purchased.
1 European Pond-Tortoise (*Emys europæa*). Presented by Master J. F. Harden.
8. 1 Common Squirrel (*Sciurus vulgaris*). Presented by Miss Edith Mackenzie.
10. 2 Red Oven-birds (*Furnarius rufus*). From the Argentine Republic. Purchased.
1 Melancholy Tyrant (*Tyrannus melancholicus*). From the Argentine Republic. Purchased.
1 Fork-tailed Tyrant (*Milvulus tyrannus*). From the Argentine Republic. Purchased.
1 Banded-tailed Tree-Snake (*Ahætulla liocerca*). From Trinidad. Presented by Messrs. Mole and Urich.
1 Cenchoa Snake (*Dipsas cenchoa*). From Trinidad. Presented by Messrs. Mole and Urich.
1 Banded-tailed Tree-Snake (*Ahætulla liocerca*). From Trinidad. Deposited.
11. 1 Black-bellied Weaver-bird (*Euplectes afer*). Presented by Miss Herring.
1 Pin-tailed Whydah-bird (*Vidua principalis*). Presented by Miss Herring.
2 Amaduvade Finches (*Estrelda amandava*). Presented by Miss Herring.
1 Orange-cheeked Waxbill (*Estrelda melpoda*). Presented by Miss Herring.
1 Common Waxbill (*Estrelda cinerea*). Presented by Miss Herring.
2 Indian Silver-bills (*Munia malabarica*). Presented by Miss Herring.
1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Presented by H. H. Forsayth, Esq.
12. 6 Edible Frogs (*Rana esculenta*). Purchased.
2 Japanese Teal (*Querquedula formosa*), ♂ ♀. Purchased.

Apr. 13. 1 Gayal (*Bibos frontalis*), ♂. Born in the Menagerie.
6 Green Tree-Frogs (*Hyla arborea*). Presented by the Rev. Clifford D. Fothergill.
1 Moorish Toad (*Bufo mauritanica*). Deposited.
14. 2 Red-backed Buzzards (*Buteo erythronotus*). From the Falkland Islands. Presented by Dr. Dale.
2 Red-backed Buzzards (*Buteo erythronotus*). From the Falkland Islands. Presented by Vere Packe, Esq.
1 Herring-Gull (*Larus argentatus*). Presented by Thomas Owen, Esq.
3 Magellanic Geese (*Bernicla magellanica*), 1 ♂, 2 ♀. Presented by Sir Roger T. Goldsworthy.
15. 1 Alexandrine Parrakeet (*Palæornis alexandri*), ♀. Presented by Mr. S. Hulme.
17. 1 Peregrine Falcon (*Falco peregrinus*). Presented by the Old Hawking Club.
1 Panama Amazon (*Chrysotis panamensis*). Received in Exchange.
4 Barbary Mice (*Mus barbarus*). Born in the Menagerie.
1 Greek Tortoise (*Testudo græca*). Presented by Mrs. Alcock.
18. 6 Indian Wild Swine (*Sus cristatus*). Born in the Menagerie.
19. 1 Orang-Outang (*Simia satyrus*), ♂. Presented by Thomas Workman, Esq. See P. Z. S. 1893, p. 435.
20. 1 Raven (*Corvus corax*). Presented by Lady Rose.
1 Spotted Ichneumon (*Herpestes nepalensis*). Presented by Lady Blake.
21. 3 Spotted-sided Finches (*Amadina lathami*). Purchased.
22. 1 Martineta Tinamou (*Calodromas elegans*). Purchased.
24. 1 Hedgehog (*Erinaceus* sp. nov.). From Somaliland. Presented by H. W. Seton-Karr, Esq. See P. Z. S. 1893, p. 435.
1 Festive Amazon (*Chrysotis festiva*). Presented by Mrs. Hill.
1 Chinese Lark (*Melanocorypha mongolica*). Presented by Mrs. Pollard.
1 Poë Honey-eater (*Prosthemadera novæ-zealandiæ*). Deposited.
1 Malabar Green Bulbul (*Phyllornis aurifrons*). Deposited.
1 Red-eared Bulbul (*Pycnonotus jocosus*). Deposited.
1 Cape Coly (*Colius capensis*). Deposited.
2 American Blue Birds (*Sialia wilsoni*). Deposited.
2 Serin Finches (*Serinus hortulanus*). From Spain. Presented by J. A. Crawford, Esq., F.Z.S.
25. 1 Bornean Gibbon (*Hylobates muelleri*), ♀. From Borneo. Presented by Leicester P. Beaufort, Esq. See P. Z. S. 1893, p. 435.
2 Madagascar Love-birds (*Agapornis cana*), ♂ ♀. Purchased.
1 Red-sided Eclectus (*Eclectus pectoralis*). Purchased.
1 Undulated Grass-Parrakeet (*Melopsittacus undulatus*). Presented by Master W. D. Savory.
2 Derbian Zonures (*Zonurus derbianus*). Deposited.
26. 1 Red Kangaroo (*Macropus rufus*), ♂. Received in Exchange.
1 Great Wallaroo (*Macropus robustus*), ♂. Received in Exchange.
6 Satin Bower-birds (*Ptilonorhynchus violaceus*). Received in Exchange.
1 Common Viper (*Vipera berus*). Presented by Briton Rivière, Esq., F.Z.S.

Apr. 27. 5 Weasels (*Mustela vulgaris*). Presented by George Long, Esq.
2 Hawfinches (*Coccothraustes vulgaris*). Presented by Mr. H. Klosz.
2 Maugé's Dasyures (*Dasyurus maugæi*), 2 ♂. Received in Exchange.
1 Satin Bower-bird (*Ptilonorhynchus violaceus*), ♂. Received in Exchange.
1 King Parrakeet (*Aprosmictus scapulatus*), ♀. Received in Exchange.
2 Diamond Snakes (*Morelia spilotus*). Received in Exchange.
1 Lesueur's Water-Lizard (*Physignathus lesueuri*). Received in Exchange.
1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Presented by E. P. Ramsay, Esq., C.M.Z.S.
28. 2 Black-necked Swans (*Cygnus nigricollis*), ♂ ♀. Purchased.
2 Great Eagle-Owls (*Bubo maximus*). Deposited.
1 Magpie Tanager (*Cissopis leveriana*). Presented by H. A. Astlett, Esq.
2 Great Cyclodus (*Cyclodus gigas*). Presented by Capt. Clarke.
29. 1 Bengalese Cat (*Felis bengalensis*). Presented by Capt. F. Whistler, H.L.I.

May 1. 1 Bennett's Wallaby (*Halmaturus bennetti*), ♂. Born in the Menagerie.
1 Angora Goat (*Capra hircus*, var.), ♂. Born in the Menagerie.
1 Indian Buffalo (*Bubalus buffelus*), ♀. Presented by H.H. The Maharaja of Bhavnagar.
1 West-African Love-bird (*Agapornis pullaria*). Presented by Lady Theodora Guest.
2 Egyptian Mastigures (*Uromastix spinipes*). Presented by Edmund Lamb, Esq.
1 Mozambique Monkey (*Cercopithecus pygerythrus*), ♀. Presented by Miss Maud Parkinson.
1 Yak (*Poëphagus grunniens*), ♀. Born in the Menagerie.
7 Green Tree-Frogs (*Hyla arborea*). Presented by the Rev. C. D. Fothergill.
20 Green Tree-Frogs (*Hyla arborea*). Deposited.
3. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by F. Byfield, Esq.
1 Common Crowned Pigeon (*Goura coronata*). Received in Exchange.
3 Cat-fish (*Amiurus catus*). Purchased.
4. 1 Water-Buck (*Cobus ellipsiprymnus*), ♀. Born in the Menagerie. See P. Z. S. 1893, p. 505, pl. xxxix.
1 Common Hedgehog (*Erinaceus europæus*). Presented by Mrs. E. Austen-Leigh.
2 Herring-Gulls (*Larus argentatus*). Presented by W. H. Aplin, Esq.
5. 1 Roseate Cockatoo (*Cacatua roseicapilla*). Deposited.
1 Moorish Tortoise (*Testudo mauritanica*). Presented by T. W. Bayley, Esq.
6. 1 Slender Gibbon (*Hylobates agilis*). From Malacca. Deposited.
1 Mozambique Monkey (*Cercopithecus pygerythrus*), ♀. Presented by Arthur James, Esq.
1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by Miss G. Lloyd.

May 6. 1 Bonnet-Monkey (*Macacus sinicus*), ♀. Presented by R. Hughes, Esq.
2 Amherst Pheasants (*Thaumalea amherstiæ*), 2 ♀. Purchased.
1 Swinhoe's Pheasant (*Euplocamus swinhoii*), ♂. Purchased.
8. 1 Yellow-cheeked Lemur (*Lemur xanthomystax*), ♂. Purchased.
1 Changeable Lizard (*Calotes versicolor*). Presented by H. L. Gibbs, Esq.
11 Green Lizards (*Lacerta viridis*). Purchased.
1 Triangular-marked Water-Snake (*Hydrops triangularis*). From Demerara. Presented by Samuel Bollers, Esq.
1 Ducorps's Cockatoo (*Cacatua ducorpsi*). Presented by R. Armitage, Esq.
10. 1 Senegal Touracou (*Corythaix persa*). Received in Exchange.
11. 1 Japanese Deer (*Cervus sika*), ♂. Born in the Menagerie.
2 Red-winged Parrakeets (*Aprosmictus erythropterus*), 2 ♀. Presented by H. Goodchild, Esq.
12. 2 Ravens (*Corvus corax*). Presented by Philip A. Wilkins, Esq.
1 Vervet Monkey (*Cercopithecus lalandii*), ♀. Deposited.
13. 1 Common Peafowl (*Pavo cristatus*), ♂. Deposited.
15. 1 Reindeer (*Rangifer tarandus*), ♂. Born in the Menagerie.
2 Red-crested Finches (*Coryphospingus cristatus*), ♂ ♀. Purchased.
16. 1 Chacma Baboon (*Cynocephalus porcarius*), ♂. Presented by Fred. Vaughan Kirby, Esq.
1 Lion (*Felis leo*), ♀. Presented by Fred. Vaughan Kirby, Esq.
1 Orange-winged Amazon (*Chrysotis amazonica*). Purchased.
12 Spotted Salamanders (*Salamandra maculosa*). Purchased.
4 Sociable Marsh-Hawks (*Rostrhamus sociabilis*). Presented by William Brown, Esq.
17. 1 Bonnet-Monkey (*Macacus sinicus*), ♂. Presented by Mrs. Vaughan Holberton.
2 Mexican Guans (*Penelope purpurascens*). Deposited.
1 Wattled Guan (*Aburria carunculata*). Deposited.
2 Madagascar Weaver-birds (*Foudia madagascariensis*). Presented by Mr. Ginn.
1 Radiated Tortoise (*Testudo radiata*). Presented by B. Smith, Esq.
18. 4 Emus (*Dromæus novæ-hollandiæ*). Presented by Charles T. Milburn, Esq.
19. 1 Diana Monkey (*Cercopithecus diana*), ♀. Presented by Surg.-Major S. J. Flood.
1 Japanese Deer (*Cervus sika*), ♂. Presented by C. J. Lucas, Esq.
1 Laughing Kingfisher (*Dacelo gigantea*). Presented by W.H. Brett, Esq.
1 White-lipped Peccary (*Dicotyles labiatus*), ♂. Purchased.
20. 1 Mozambique Monkey (*Cercopithecus pygerythrus*), ♂. Presented by Lewis Atkinson, Esq.
1 Sykes's Monkey (*Cercopithecus albigularis*), ♂. From Mombasa, E. Africa. Presented by Thomas E. C. Remington, Esq.
1 Garnett's Galago (*Galago garnetti*). From Mombasa, E. Africa. Presented by Thomas E. C. Remington, Esq.
23. 1 Common Hedgehog (*Erinaceus europæus*, white variety). Presented by R. T. Hermon-Hodge, Esq.
24. 1 Jaguar (*Felis onca*), ♀. Purchased.
1 Black-necked Swan (*Cygnus nigricollis*), ♂. Purchased.

May 24. 1 Guillemot (*Lomvia troïle*). Presented by H. B. Hewetson, Esq., F.Z.S.
2 Ring-hals Snakes (*Sepedon hæmachates*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Aurora Snake (*Lamprophis aurora*). Presented by T. E. Goodall, Esq.
25. 2 Schlagintweit's Frogs (*Rana cyanophlyctis*). From Ceylon. Presented by H. L. Gibbs, Esq.
1 Tigrine Frog (*Rana tigrina*). From Ceylon. Presented by H. L. Gibbs, Esq.
26. 1 Ruddy Ichneumon (*Herpestes smithi*). Presented by Maurice Walsh, Esq.
1 Levaillant's Amazon (*Chrysotis levaillanti*). Deposited.
1 Cardinal Grosbeak (*Cardinalis virginianus*). Deposited.
1 Rose-breasted Grosbeak (*Hedymeles ludovicianus*). Deposited.
1 Grey Parrot (*Psittacus erithacus*). Deposited.
12 Green Lizards (*Lacerta viridis*). Purchased.
27. 2 Striped Hyænas (*Hyæna striata*). Purchased.
29. 1 Barbary Ape (*Macacus innus*), ♀. Presented by A. G. F. Dashwood, Esq.
1 Sykes's Monkey (*Cercopithecus albigularis*), ♀. Deposited.
1 Suricate (*Suricata tetradactyla*). Presented by L. V. Harcourt, Esq.
1 Leucoryx (*Oryx leucoryx*), ♀. Deposited.
2 Brazilian Cariamas (*Cariama cristata*). Purchased.
3 Chinese Quails (*Coturnix chinensis*), 1 ♂, 2 ♀. Presented by W. J. Ingram, Esq.
30. 1 Mexican Deer (*Cariacus mexicanus*), ♂. Deposited.
1 Leopard Tortoise (*Testudo pardalis*). Deposited.
2 Derbian Zonures (*Zonurus derbianus*). Deposited.
1 Harlequin Snake (*Elaps fulvius*). From Florida. Presented by C. Ernest Brewerton, Esq.
4 Black-tailed Godwits (*Limosa ægocephala*). Purchased.
31. 1 Barbary Sheep (*Ovis tragelaphus*), ♂. Born in the Menagerie.
1 Great Kangaroo (*Macropus giganteus*), ♀. Born in the Menagerie.

June 1. 2 Kingfishers (*Alcedo ispida*). Presented by Mr. A. K. Dixon.
2. 4 Flamingoes (*Phœnicopterus antiquorum*). Purchased.
1 Japanese Deer (*Cervus sika*), ♀. Born in the Menagerie.
1 Angora Goat (*Capra hircus*, var.), ♀. Born in the Menagerie
3. 1 Malayan Tapir (*Tapirus indicus*), ♂. Deposited.
2 Common Cassowaries (*Casuarius galeatus*, jr.). Deposited.
1 Horned Lizard (*Phrynosoma cornutum*). Presented by Harland Coates, Esq.
5. 4 Tuberculated Iguanas (*Iguana tuberculata*). Deposited.
2 Horned Lizards (*Phrynosoma cornutum*). Deposited.
6. 1 Red-handed Tamarin (*Midas rufimanus*). Deposited.
1 Himalayan Bear (*Ursus tibetanus*), ♂. Presented by Capt. Michael Hughes, 2nd Life Guards.
4 South Island Robins (*Miro albifrons*). From New Zealand. Presented by Capt. Edgar J. Evans. See P. Z. S. 1893, p. 612.
7. 1 Stairs's Monkey (*Cercopithecus stairsi*), ♂. From Mozambique. Presented by Mr. F. Hintze. See P.Z.S. 1893, p. 612.
1 Japanese Deer (*Cervus sika*), ♀. Born in the Menagerie.
8. 1 Yellow-footed Rock-Kangaroo (*Petrogale xanthopus*), ♂. Deposited.

Apr. 13. 1 Gayal (*Bibos frontalis*), ♂. Born in the Menagerie.
6 Green Tree-Frogs (*Hyla arborea*). Presented by the Rev. Clifford D. Fothergill.
1 Moorish Toad (*Bufo mauritanica*). Deposited.
14. 2 Red-backed Buzzards (*Buteo erythronotus*). From the Falkland Islands. Presented by Dr. Dale.
2 Red-backed Buzzards (*Buteo erythronotus*). From the Falkland Islands. Presented by Vere Packe, Esq.
1 Herring-Gull (*Larus argentatus*). Presented by Thomas Owen, Esq.
3 Magellanic Geese (*Bernicla magellanica*), 1 ♂, 2 ♀. Presented by Sir Roger T. Goldsworthy.
15. 1 Alexandrine Parrakeet (*Palæornis alexandri*), ♀. Presented by Mr. S. Hulme.
17. 1 Peregrine Falcon (*Falco peregrinus*). Presented by the Old Hawking Club.
1 Panama Amazon (*Chrysotis panamensis*). Received in Exchange.
4 Barbary Mice (*Mus barbarus*). Born in the Menagerie.
1 Greek Tortoise (*Testudo græca*). Presented by Mrs. Alcock.
18. 6 Indian Wild Swine (*Sus cristatus*). Born in the Menagerie.
19. 1 Orang-Outang (*Simia satyrus*), ♂. Presented by Thomas Workman, Esq. See P. Z. S. 1893, p. 435.
20. 1 Raven (*Corvus corax*). Presented by Lady Rose.
1 Spotted Ichneumon (*Herpestes nepalensis*). Presented by Lady Blake.
21. 3 Spotted-sided Finches (*Amadina lathami*). Purchased.
22. 1 Martineta Tinamou (*Calodromas elegans*). Purchased.
24. 1 Hedgehog (*Erinaceus* sp. nov.). From Somaliland. Presented by H. W. Seton-Karr, Esq. See P. Z. S. 1893, p. 435.
1 Festive Amazon (*Chrysotis festiva*). Presented by Mrs. Hill.
1 Chinese Lark (*Melanocorypha mongolica*). Presented by Mrs. Pollard.
1 Poë Honey-eater (*Prosthemadera novæ-zealandiæ*). Deposited.
1 Malabar Green Bulbul (*Phyllornis aurifrons*). Deposited.
1 Red-eared Bulbul (*Pycnonotus jocosus*). Deposited.
1 Cape Coly (*Colius capensis*). Deposited.
2 American Blue Birds (*Sialia wilsoni*). Deposited.
2 Serin Finches (*Serinus hortulanus*). From Spain. Presented by J. A. Crawford, Esq., F.Z.S.
25. 1 Bornean Gibbon (*Hylobates muelleri*), ♀. From Borneo. Presented by Leicester P. Beaufort, Esq. See P. Z. S. 1893, p. 435.
2 Madagascar Love-birds (*Agapornis cana*), ♂ ♀. Purchased.
1 Red-sided Eclectus (*Eclectus pectoralis*). Purchased.
1 Undulated Grass-Parrakeet (*Melopsittacus undulatus*). Presented by Master W. D. Savory.
2 Derbian Zonures (*Zonurus derbianus*). Deposited.
26. 1 Red Kangaroo (*Macropus rufus*), ♂. Received in Exchange.
1 Great Wallaroo (*Macropus robustus*), ♂. Received in Exchange.
6 Satin Bower-birds (*Ptilonorhynchus violaceus*). Received in Exchange.
1 Common Viper (*Vipera berus*). Presented by Briton Rivière, Esq., F.Z.S.

Apr. 27. 5 Weasels (*Mustela vulgaris*). Presented by George Long, Esq.
2 Hawfinches (*Coccothraustes vulgaris*). Presented by Mr. H. Klosz.
2 Maugé's Dasyures (*Dasyurus maugæi*), 2 ♂. Received in Exchange.
1 Satin Bower-bird (*Ptilonorhynchus violaceus*), ♂. Received in Exchange.
1 King Parrakeet (*Aprosmictus scapulatus*), ♀. Received in Exchange.
2 Diamond Snakes (*Morelia spilotus*). Received in Exchange.
1 Lesueur's Water-Lizard (*Physignathus lesueuri*). Received in Exchange.
1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Presented by E. P. Ramsay, Esq., C.M.Z.S.
28. 2 Black-necked Swans (*Cygnus nigricollis*), ♂ ♀. Purchased.
2 Great Eagle-Owls (*Bubo maximus*). Deposited.
1 Magpie Tanager (*Cissopis leveriana*). Presented by H. A. Astlett, Esq.
2 Great Cyclodus (*Cyclodus gigas*). Presented by Capt. Clarke.
29. 1 Bengalese Cat (*Felis bengalensis*). Presented by Capt. F. Whistler, H.L.I.

May 1. 1 Bennett's Wallaby (*Halmaturus bennetti*), ♂. Born in the Menagerie.
1 Angora Goat (*Capra hircus*, var.), ♂. Born in the Menagerie.
1 Indian Buffalo (*Bubalus buffelus*), ♀. Presented by H.H. The Maharaja of Bhavnagar.
1 West-African Love-bird (*Agapornis pullaria*). Presented by Lady Theodora Guest.
2 Egyptian Mastigures (*Uromastix spinipes*). Presented by Edmund Lamb, Esq.
1 Mozambique Monkey (*Cercopithecus pygerythrus*), ♀. Presented by Miss Maud Parkinson.
1 Yak (*Poëphagus grunniens*), ♀. Born in the Menagerie.
7 Green Tree-Frogs (*Hyla arborea*). Presented by the Rev. C. D. Fothergill.
20 Green Tree-Frogs (*Hyla arborea*). Deposited.
3. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by F. Byfield, Esq.
1 Common Crowned Pigeon (*Goura coronata*). Received in Exchange.
3 Cat-fish (*Amiurus catus*). Purchased.
4. 1 Water-Buck (*Cobus ellipsiprymnus*), ♀. Born in the Menagerie. See P. Z. S. 1893, p. 505, pl. xxxix.
1 Common Hedgehog (*Erinaceus europæus*). Presented by Mrs. E. Austen-Leigh.
2 Herring-Gulls (*Larus argentatus*). Presented by W. H. Aplin, Esq.
5. 1 Roseate Cockatoo (*Cacatua roseicapilla*). Deposited.
1 Moorish Tortoise (*Testudo mauritanica*). Presented by T. W. Bayley, Esq.
6. 1 Slender Gibbon (*Hylobates agilis*). From Malacca. Deposited.
1 Mozambique Monkey (*Cercopithecus pygerythrus*), ♀. Presented by Arthur James, Esq.
1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by Miss G. Lloyd.

May 6. 1 Bonnet-Monkey (*Macacus sinicus*), ♀. Presented by R. Hughes, Esq.
2 Amherst Pheasants (*Thaumalea amherstiæ*), 2 ♀. Purchased.
1 Swinhoe's Pheasant (*Euplocamus swinhoii*), ♂. Purchased.
8. 1 Yellow-cheeked Lemur (*Lemur xanthomystax*), ♂. Purchased.
1 Changeable Lizard (*Calotes versicolor*). Presented by H. L. Gibbs, Esq.
11 Green Lizards (*Lacerta viridis*). Purchased.
1 Triangular-marked Water-Snake (*Hydrops triangularis*). From Demerara. Presented by Samuel Bollers, Esq.
1 Ducorps's Cockatoo (*Cacatua ducorpsi*). Presented by R. Armitage, Esq.
10. 1 Senegal Touracou (*Corythaix persa*). Received in Exchange.
11. 1 Japanese Deer (*Cervus sika*), ♂. Born in the Menagerie.
2 Red-winged Parrakeets (*Aprosmictus erythropterus*), 2 ♀. Presented by H. Goodchild, Esq.
12. 2 Ravens (*Corvus corax*). Presented by Philip A. Wilkins, Esq.
1 Vervet Monkey (*Cercopithecus lalandii*), ♀. Deposited.
13. 1 Common Peafowl (*Pavo cristatus*), ♂. Deposited.
15. 1 Reindeer (*Rangifer tarandus*), ♂. Born in the Menagerie.
2 Red-crested Finches (*Coryphospingus cristatus*), ♂ ♀. Purchased.
16. 1 Chacma Baboon (*Cynocephalus porcarius*), ♂. Presented by Fred. Vaughan Kirby, Esq.
1 Lion (*Felis leo*), ♀. Presented by Fred. Vaughan Kirby, Esq.
1 Orange-winged Amazon (*Chrysotis amazonica*). Purchased.
12 Spotted Salamanders (*Salamandra maculosa*). Purchased.
4 Sociable Marsh-Hawks (*Rostrhamus sociabilis*). Presented by William Brown, Esq.
17. 1 Bonnet-Monkey (*Macacus sinicus*), ♂. Presented by Mrs. Vaughan Holberton.
2 Mexican Guans (*Penelope purpurascens*). Deposited.
1 Wattled Guan (*Aburria carunculata*). Deposited.
2 Madagascar Weaver-birds (*Foudia madagascariensis*). Presented by Mr. Ginn.
1 Radiated Tortoise (*Testudo radiata*). Presented by B. Smith, Esq.
18. 4 Emus (*Dromæus novæ-hollandiæ*). Presented by Charles T. Milburn, Esq.
19. 1 Diana Monkey (*Cercopithecus diana*), ♀. Presented by Surg.-Major S. J. Flood.
1 Japanese Deer (*Cervus sika*), ♂. Presented by C. J. Lucas, Esq.
1 Laughing Kingfisher (*Dacelo gigantea*). Presented by W.H. Brett, Esq.
1 White-lipped Peccary (*Dicotyles labiatus*), ♂. Purchased.
20. 1 Mozambique Monkey (*Cercopithecus pygerythrus*), ♂. Presented by Lewis Atkinson, Esq.
1 Sykes's Monkey (*Cercopithecus albigularis*), ♂. From Mombasa, E. Africa. Presented by Thomas E. C. Remington, Esq.
1 Garnett's Galago (*Galago garnetti*). From Mombasa, E. Africa. Presented by Thomas E. C. Remington, Esq.
23. 1 Common Hedgehog (*Erinaceus europæus*, white variety). Presented by R. T. Hermon-Hodge, Esq.
24. 1 Jaguar (*Felis onca*), ♀. Purchased.
1 Black-necked Swan (*Cygnus nigricollis*), ♂. Purchased.

May 24. 1 Guillemot (*Lomvia troile*). Presented by H. B. Hewetson, Esq., F.Z.S.
2 Ring-hals Snakes (*Sepedon hæmachates*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Aurora Snake (*Lamprophis aurora*). Presented by T. E. Goodall, Esq.
25. 2 Schlagintweit's Frogs (*Rana cyanophlyctis*). From Ceylon. Presented by H. L. Gibbs, Esq.
1 Tigrine Frog (*Rana tigrina*). From Ceylon. Presented by H. L. Gibbs, Esq.
26. 1 Ruddy Ichneumon (*Herpestes smithi*). Presented by Maurice Walsh, Esq.
1 Levaillant's Amazon (*Chrysotis levaillanti*). Deposited.
1 Cardinal Grosbeak (*Cardinalis virginianus*). Deposited.
1 Rose-breasted Grosbeak (*Hedymeles ludovicianus*). Deposited.
1 Grey Parrot (*Psittacus erithacus*). Deposited.
12 Green Lizards (*Lacerta viridis*). Purchased.
27. 2 Striped Hyænas (*Hyæna striata*). Purchased.
29. 1 Barbary Ape (*Macacus innus*), ♀. Presented by A. G. F. Dashwood, Esq.
1 Sykes's Monkey (*Cercopithecus albigularis*), ♀. Deposited.
1 Suricate (*Suricata tetradactyla*). Presented by L. V. Harcourt, Esq.
1 Leucoryx (*Oryx leucoryx*), ♀. Deposited.
2 Brazilian Cariamas (*Cariama cristata*). Purchased.
3 Chinese Quails (*Coturnix chinensis*), 1 ♂, 2 ♀. Presented by W. J. Ingram, Esq.
30. 1 Mexican Deer (*Cariacus mexicanus*), ♂. Deposited.
1 Leopard Tortoise (*Testudo pardalis*). Deposited.
2 Derbian Zonures (*Zonurus derbianus*). Deposited.
1 Harlequin Snake (*Elaps fulvius*). From Florida. Presented by C. Ernest Brewerton, Esq.
4 Black-tailed Godwits (*Limosa ægocephala*). Purchased.
31. 1 Barbary Sheep (*Ovis tragelaphus*), ♂. Born in the Menagerie.
1 Great Kangaroo (*Macropus giganteus*), ♀. Born in the Menagerie.

June 1. 2 Kingfishers (*Alcedo ispida*). Presented by Mr. A. K. Dixon.
2. 4 Flamingoes (*Phœnicopterus antiquorum*). Purchased.
1 Japanese Deer (*Cervus sika*), ♀. Born in the Menagerie.
1 Angora Goat (*Capra hircus*, var.), ♀. Born in the Menagerie
3. 1 Malayan Tapir (*Tapirus indicus*), ♂. Deposited.
2 Common Cassowaries (*Casuarius galeatus*, jr.). Deposited.
1 Horned Lizard (*Phrynosoma cornutum*). Presented by Harland Coates, Esq.
5. 4 Tuberculated Iguanas (*Iguana tuberculata*). Deposited.
2 Horned Lizards (*Phrynosoma cornutum*). Deposited.
6. 1 Red-handed Tamarin (*Midas rufimanus*). Deposited.
1 Himalayan Bear (*Ursus tibetanus*), ♂. Presented by Capt. Michael Hughes, 2nd Life Guards.
4 South Island Robins (*Miro albifrons*). From New Zealand. Presented by Capt. Edgar J. Evans. See P. Z. S. 1893, p. 612.
7. 1 Stairs's Monkey (*Cercopithecus stairsi*), ♂. From Mozambique. Presented by Mr. F. Hintze. See P. Z. S. 1893, p. 612.
1 Japanese Deer (*Cervus sika*), ♀. Born in the Menagerie.
8. 1 Yellow-footed Rock-Kangaroo (*Petrogale xanthopus*), ♂. Deposited.

June 8. 12 Horned Lizards (*Phrynosoma cornutum*). Deposited.
9. 2 Malbrouck Monkeys (*Cercopithecus cynosurus*). Purchased.
4 Bronze-wing Pigeons (*Phaps chalcoptera*), 2 ♂, 2 ♀. Purchased.
2 Australian Sheldrakes (*Tadorna tadornoides*), ♂ ♀. Purchased.
2 Carrion-Crows (*Corvus corone*). Presented by the Hon. Wm. Edwardes.
4 Green Waxbills (*Estrelda formosa*). Purchased.
1 Rose-crested Cockatoo (*Cacatua moluccensis*). Presented by J. B. Sutherland, Esq.
2 Horned Lizards (*Phrynosoma cornutum*). Presented by Mr. A. E. Jamrach.
10. 4 Barbary Mice (*Mus barbarus*). Born in the Menagerie.
1 Maugé's Dasyure (*Dasyurus maugæi*), ♀. Presented by Mr. Robert Hoade.
1 Herring-Gull (*Larus argentatus*). Presented by Miss M. A. Croxford.
1 Long-eared Owl (*Asio otus*). Presented by Mr. Alan F. Crossman.
1 Tawny Owl (*Syrnium aluco*). Presented by Mr. Alan F. Crossman.
11. 1 Vervet Monkey (*Cercopithecus lalandii*). Born in the Menagerie.
12. 2 Capybaras (*Hydrochærus capybara*). Purchased.
1 Derbian Wallaby (*Halmaturus derbianus*), ♀. Born in the Menagerie.
3 Peba Armadillos (*Tatusia peba*), 2 ♂, 1 ♀. Presented by Woodbine Parish, Esq.
5 Spotted-billed Ducks (*Anas pœcilorhyncha*), 4 ♂, 1 ♀. Presented by Sir E. C. Buck, C.M.Z.S.
1 Guillemot (*Lomvia troile*). Presented by T. A. Cotton, Esq., F.Z.S.
14. 2 Chiffchaffs (*Phylloscopus rufus*). Presented by Miss McGill.
2 Yellow Wagtails (*Motacilla flava*). Presented by Miss McGill.
1 Small-lobed Chameleon (*Chamæleon parvilobus*). From Barberton, Transvaal. Presented by Dr. Percy Rendall, F.Z.S.
1 Naked-necked Iguana (*Iguana delicatissima*). From Caicos Islands, W. Indies. Presented by Lady Blake.
15. 2 Brazilian Cariamas (*Cariama cristata*). From Paraguay. Presented by A. E. Macalister-Hadwen, Esq.
1 Burrhel Wild Sheep (*Ovis burrhel*), ♀. Born in the Menagerie.
16. 1 English Wild Bull (*Bos taurus*, var.). Born in the Menagerie.
18. 4 Hybrid Finches (between *Carduelis elegans* ♂ and *Chloris kawarahibi* ♀). Bred in the Menagerie.
2 Yellow-legged Herring-Gulls (*Larus cachinnans*). Bred in the Menagerie.
19. 1 Mozambique Monkey (*Cercopithecus pygerythrus*), ♂. Presented by J. B. Tomkins, Esq.
2 Llamas (*Lama peruana*), ♂ ♀. Presented by Lady Meux, F.Z.S.
1 Rose-crested Cockatoo (*Cacatua moluccensis*). Presented by Mrs. Bason.
1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Presented by Lewis Bailey, Esq.

June 19. 1 Martineta Tinamou (*Calodromas elegans*). Hatched in the Menagerie.
2 Brazilian Tortoises (*Testudo tabulata*). From Trinidad, W. I. Presented by J. S. Toppin, Esq.
20. 1 Mozambique Monkey (*Cercopithecus pygerythrus*), ♂. From Zanzibar. Presented by B. J. Travers, Esq.
1 Ocellated Skink (*Seps ocellatus*). From Malta. Presented by Col. C. H. Rooke.
21. 1 Cinereous Waxbill (*Estrelda cærulescens*). Presented by W. L. Jeffery, Esq.
1 Amaduvade Finch (*Estrelda amandava*). Presented by W. L. Jeffery, Esq.
2 Hooded Finches (*Spermestes cucullata*). Presented by W. L. Jeffery, Esq.
2 Nutmeg Finches (*Munia punctularia*). Presented by W. L. Jeffery, Esq.
1 Black-headed Finch (*Munia malacca*). Presented by W. L. Jeffery, Esq.
1 Grenadier Weaver-bird (*Euplectes oryx*). Presented by W. L. Jeffery, Esq.
2 Emus (*Dromæus novæ-hollandiæ*). Deposited.
2 Infernal Snakes (*Boodon infernalis*, jr.). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
23. 2 Collared Fruit-Bats (*Cynonycteris collaris*). Born in the Menagerie.
1 Burrhel Wild Sheep (*Ovis burrhel*), ♂. Born in the Menagerie.
2 Greater Spotted Woodpeckers (*Dendrocopus major*). Presented by Miss Miriam A. Birch Reynardson.
24. 2 Alexandrine Parrakeets (*Palæornis alexandri*), ♂ ♀. Presented by Wyndham Gibbes, Esq.
26. 2 Wild Swine (*Sus scrofa*), ♂ ♀. Presented by Jasper A. Mathews, Esq.
2 Black-headed Gulls (*Larus ridibundus*). Bred in the Menagerie.
27. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Mr. W. Henegan.
1 Purple Heron (*Ardea purpurea*). Presented by R. Heywood, Esq.
2 Rufescent Teguexins (*Tupinambis rufescens*). Deposited.
28. 1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by J. H. Brown, Esq.
29. 6 European Beavers (*Castor fiber*). From the River Rhone, France. Purchased. See P. Z. S. 1893, p. 612.
1 Brown Bear (*Ursus arctos*), ♀. Presented by F. Collier, Esq., F.Z.S.
1 Leadbeater's Cockatoo (*Cacatua leadbeateri*). Presented by Mrs. Anna Margaret Hills.
30. 1 Guilding's Amazon (*Chrysotis guildingi*). Presented by the Hon. Sir. Walter Hely-Hutchinson, K.C.M.G.
2 Cooke's Tree-Boas (*Corallus cookii*). From Grenada, W.I. Presented by the Hon. Sir Walter Hely-Hutchinson, K.C.M.G.
3 Common Marmosets (*Hapale jacchus*). Presented by Hope Gibson, Esq.
1 Thar (*Capra jemlaica*), ♂. Born in the Menagerie.

July 1. 1 Brazilian Cariama (*Cariama cristata*). Presented by Howard C. Wolfe, Esq.
1 Barn-Owl (*Strix flammea*). Presented by Howard C. Wolfe, Esq.
1 King Vulture (*Gypagus papa*). Presented by Howard C. Wolfe, Esq.
1 Grey Buzzard-Hawk (*Asturina plagiata*). Presented by Howard C. Wolfe, Esq.
1 Illiger's Macaw (*Ara maracana*). Deposited.
2 Yellow-headed Conures (*Conurus jendaya*). Deposited.
8 Garganey Teal (*Querquedula circia*), 4 ♂, 4 ♀. Purchased.
6 Common Teal (*Querquedula crecca*), 3 ♂, 3 ♀. Purchased.
3. 1 Thar (*Capra jemlaica*), ♀. Born in the Menagerie.
1 Cardinal Grosbeak (*Cardinalis virginianus*). Bred in the Menagerie.
2 Australian Crows (*Corvus australis*), ♂ ♀. Purchased.
7. 1 American Black Bear (*Ursus americanus*). Presented by Joseph Politzer, Esq.
1 Hawk's-billed Turtle (*Chelone imbricata*). Presented by C. Melhado, Esq.
8. 2 Common Buzzards (*Buteo vulgaris*). Deposited.
9. 1 Triangular-spotted Pigeon (*Columba guinea*). Bred in the Menagerie.
2 Hybrid Wagtails (between *Motacilla lugubris* ♂ and *Motacilla melanope* ♀). Bred in the Menagerie.
10. 4 Prairie Marmots (*Cynomys ludovicianus*). Presented by G. B. Coleman, Esq.
4 Orbicular Horned Lizards (*Phrynosoma orbiculare*). Presented by G. B. Coleman.
1 Leopard (*Felis pardus*). Presented by Capt. Currie.
1 Striped Hyæna (*Hyæna striata*). Presented by Capt. Currie.
11. 1 Harnessed Antelope (*Tragelaphus scriptus*), ♂. Presented by A. L. Jones, Esq.
2 African Tantalus (*Pseudotantalus ibis*). Purchased.
2 Common Rheas (*Rhea americana*), ♂ ♀. Purchased.
1 Secretary Vulture (*Serpentarius reptilivorus*). Purchased.
3 Demoiselle Cranes (*Grus virgo*). Purchased.
2 Cabot's Tragopans (*Ceriornis caboti*), ♂ ♀. Purchased.
4 Crested Pigeons (*Ocyphaps lophotes*). Purchased.
1 Australian Cassowary (*Casuarius australis*). Deposited.
2 Blyth's Tragopans (*Ceriornis blythi*), ♂ ♀. Deposited.
4 Galapagan Doves (*Zenaida galapagensis*). Presented by Capt. Hedworth Lambton, R.N.
1 Auriculated Dove (*Zenaida auriculata*). Presented by Capt. Hedworth Lambton, R.N.
12. 1 Mule Deer (*Cariacus macrotis*), ♂. Born in the Menagerie.
1 Martineta Tinamou (*Calodromas elegans*). Bred in the Menagerie.
7 Summer Ducks (*Æx sponsa*). Bred in the Menagerie.
7 Mandarin Ducks (*Æx galericulata*). Bred in the Menagerie.
6 Magellanic Geese (*Bernicla magellanica*). Bred in the Menagerie.
3 Australian Wild Ducks (*Anas superciliosa*). Bred in the Menagerie.
13. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by Capt. R. D. Arnold.

July 13. 1 Guilding's Amazon (*Chrysotis guildingi*). From St. Vincent, W.I. Presented by the Hon. Sir Walter F. Hely-Hutchinson, K.C.M.G.
3 Boddaert's Snakes (*Coluber boddaerti*). From Grenada, W.I. Presented by the Hon. Sir Walter F. Hely-Hutchinson, K.C.M.G.
3 Carinated Snakes (*Herpetodryas carinatus*). From Grenada, W.I. Presented by the Hon. Sir Walter F. Hely-Hutchinson, K.C.M.G.
2 Red-tailed Buzzards (*Buteo borealis*). From Jamaica. Presented by Charles B. Taylor, Esq.
6 Moorish Tortoises (*Testudo mauritanica*). Purchased.
14. 1 Malayan Bear (*Ursus malayanus*). Presented by M. O. N. Rees-Webbe, Esq.
1 Crested Porcupine (*Hystrix cristata*). Deposited.
3 Peacock Pheasants (*Polyplectron chinquis*). Bred in the Menagerie.
3 Cheer Pheasants (*Phasianus wallichii*). Bred in the Menagerie.
6 Gold Pheasants (*Thaumalea picta*). Bred in the Menagerie.
1 Mandarin Duck (*Æx galericulata*), ♂. Purchased.
17. 2 Dominican Gulls (*Larus dominicanus*). Bred in the Menagerie.
18. 1 Black Ape (*Cynopithecus niger*), ♀. Purchased.
2 Black-headed Mynahs (*Temenuchus pagodarum*). Purchased.
2 Manyar Weaver-birds (*Ploceus manyar*), ♂ ♀. Purchased.
2 Red-headed Buntings (*Emberiza luteola*), ♂ ♀. Purchased.
19. 1 Banded Ichneumon (*Herpestes fasciatus*). Deposited.
2 Great Eagle-Owls (*Bubo maximus*). Presented by Lord Hill.
2 Barbary Turtle-Doves (*Turtur risorius*) (white varieties). From the Pescadores Islands. Presented by T. A. W. Hance, Esq., C.M.Z.S.
3 Giant Toads (*Bufo agua*). Presented by — Adamson, Esq.
20. 1 Yellow-cheeked Lemur (*Lemur xanthomystax*). Deposited.
24. 1 Golden Eagle (*Aquila chrysaëtus*). From Scotland. Presented by Hugh Cameron Ross, Esq.
4 Midwife Toads (*Alytes obstetricans*). From Belgium. Presented by Prof. Gustave Gilson.
25. 1 American Tapir (*Tapirus americanus*), ♀. From British Guiana. Deposited.
1 American Jabiru (*Mycteria americana*). Deposited.
2 Common Foxes (*Canis vulpes*). Presented by Reginald Chandos Pole, Esq.
1 Red-bellied Tanager (*Tanagrella velia*). Presented by Sir Wm. Ingram, Bt., M.P.
26. 1 Crab-eating Opossum (*Didelphys cancrivorus*). Deposited.
1 Common Paradoxure (*Paradoxurus typus*). Presented by Mrs. Oswald Walmsley.
2 Azara's Foxes (*Canis azaræ*). Presented by Lord Lilford, F.Z.S.
1 Crab-eating Raccoon (*Procyon cancrivorus*). Presented by Lord Lilford, F.Z.S.
27. 1 Australian Cassowary (*Casuarius australis*). Deposited.
1 European Pond-Tortoise (*Emys europæa*). Presented by Mdlle. Lajeunesse.
28. 1 Wild Cat (*Felis catus*). Deposited.

July 28. 1 Red Deer (*Cervus elaphus*), ♀. Presented by C. J. H. Tower, Esq., F.Z.S.
1 Spotted Eagle (*Aquila clanga*). Presented by Lord Lilford, F.Z.S.
2 Blue-crowned Conures (*Conurus hæmorrhous*). Deposited.
29. 1 Yaguarundi Cat (*Felis yaguarundi*, jr.). From Maceio, Brazil. Presented by J. E. Wolfe, Esq., C.M.Z.S.
1 Brazilian Hare (*Lepus brasiliensis*). From Maceio, Brazil. Presented by J. E. Wolfe, Esq., C.M.Z.S.
31. 1 Ring-tailed Lemur (*Lemur catta*), ♂. Deposited.
1 Leadbeater's Cockatoo (*Cacatua leadbeateri*). Presented by Capt. W. St. George Ord.

Aug. 1. 1 Imperial Eagle (*Aquila imperialis*). Presented by Charles Clifton Dicconson, Esq., F.Z.S.
2 Great Eagle-Owls (*Bubo maximus*). Presented by Charles Clifton Dicconson, Esq., F.Z.S.
1 Common Jay (*Garrulus glandarius*). Presented by Walter D. Marks, Esq.
2 Alligators (*Alligator mississippiensis*). Presented by Walter D. Marks, Esq.
1 Yellow-billed Sheath-bill (*Chionis alba*). Captured at sea, 50 miles S.E. of Staten Island, Cape St. John. Presented by Capt. E. England (s. 'Thistle').
2. 1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by G. Lindsay Johnson, Esq., M.D., F.Z.S.
1 Brown Capuchin (*Cebus fatuellus*), ♂. Deposited.
17 Guillemots (*Lomvia troile*). Presented by Thomas A. Cotton, Esq., F.Z.S.
2 Puffins (*Fratercula arctica*). Presented by Thomas A. Cotton, Esq., F.Z.S.
12 Kittiwakes (*Rissa tridactyla*). Presented by Thomas A. Cotton, Esq., F.Z.S.
1 Cape Crowned Crane (*Balearica chrysopelargus*). Presented by E. S. Spooner, Esq.
3. 1 Yak (*Poephagus grunniens*), ♂. Born in the Menagerie.
2 Peregrine Falcons (*Falco peregrinus*). From Rathlin Island, Co. Antrim. Presented by Capt. R. A. Ogilby, F.Z.S.
10 Slowworms (*Anguis fragilis*). Presented by F. A. Leach, Esq.
4. 1 Ring-tailed Coati (*Nasua rufa*). Deposited.
1 Larger Hill-Mynah (*Gracula intermedia*). Presented by Dr. Best.
1 Lesser White-nosed Monkey (*Cercopithecus petaurista*). Deposited.
1 Black Rat (*Mus rattus*). Presented by Archd. E. Scott, Esq., F.Z.S.
12 Midwife Toads (*Alytes obstetricans*). Hatched in the Gardens.
5. 1 Brown Capuchin (*Cebus fatuellus*), ♂. Presented by Mr. T. Birks.
2 Montagu's Harriers (*Circus cinereaceus*). Presented by Lord Lilford, F.Z.S.
1 Blue-and-Yellow Macaw (*Ara ararauna*). Presented by Lieut. Andrews, R.N.
8. 2 Ruffed Lemurs (*Lemur varius*), ♂♀. Presented by Mrs. Brightwen.

Aug. 9. 1 Black-headed Caique (*Caica melanocephala*). Deposited.
1 Regent-bird (*Sericulus melinus*), ♀. Purchased.
10. 3 Long-eared Owls (*Asio otus*). Presented by Edward Hart, Esq., F.Z.S.
1 Tawny Owl (*Syrnium aluco*). Presented by Edward Hart, Esq., F.Z.S.
11. 1 Common Chameleon (*Chamæleon vulgaris*). Presented by E. Palmer, Esq.
12. 5 Shags (*Phalacrocorax graculus*). Presented by Maclaine of Lochbuie.
14. 1 Mona Monkey (*Cercopithecus mona*). Presented by the Misses Price.
15. 1 Slender-billed Cockatoo (*Licmetis tenuirostris*). Deposited.
1 Short-toed Eagle (*Circaëtus gallicus*). From Spain. Presented by Lord Lilford, F.Z.S.
16. 1 Black-headed Gull (*Larus ridibundus*). Presented by Mrs. H. S. Wardrop.
1 Bonnet-Monkey (*Macacus sinicus*), ♀. Presented by D. J. Harris, Esq.
1 Indian Kite (*Milvus govinda*). Presented by A. Savory, Esq.
4 Avocets (*Recurvirostra avocetta*). Purchased.
1 Common Tern (*Sterna hirundo*). Purchased.
6 Avocets (*Recurvirostra avocetta*). Deposited.
18. 1 Yellow-cheeked Lemur (*Lemur xanthomystax*). Deposited.
6 Little Bitterns (*Ardetta minuta*). Presented by Lord Lilford, F.Z.S.
19. 1 Yellow-margined Terrapin (*Cyclemys flavo-marginata*). From Formosa. Presented by P. Aug. Holst, Esq.
3 Bennett's Terrapins (*Ocadia sinensis*). From Formosa. Presented by P. Aug. Holst, Esq.
1 Golden Cat (*Felis moormensis*). Received in Exchange.
1 Japanese Ape (*Macacus speciosus*), ♂. Purchased.
1 Spotted Hawk-Eagle (*Spizaëtus nipalensis*). Purchased.
21. 1 Bonnet-Monkey (*Macacus sinicus*), ♂. Presented by Mrs. H. Leavitt.
1 European Tree-Frog (*Hyla arborea*). Presented by Mr. Hood.
2 Fire-bellied Toads (*Bombinator igneus*). Presented by Mr. Hood.
1 Spotted Salamander (*Salamandra maculosa*). Presented by Mr. Hood.
22. 1 Blaubok (*Cephalophus pygmæus*), ♂. Presented by J. E. Matcham, Esq.
23. 1 Wapiti Deer (*Cervus canadensis*), ♂. Born in the Menagerie.
24. 1 Common Boa (*Boa constrictor*). Deposited.
25. 1 Yellow Baboon (*Cynocephalus babouin*), ♂. From Mombasa, East Africa. Presented by Thomas E. C. Remington, Esq.
1 Banded Gymnogene (*Polyboroides typicus*). From Mombasa, East Africa. Presented by Thomas E. C. Remington, Esq.
1 White-necked Stork (*Dissura episcopus*). From Mombasa, East Africa. Presented by Thomas E. C. Remington, Esq.
1 Rose-crested Cockatoo (*Cacatua moluccensis*). Presented by Lady Sudeley.
11 Garden Dormice (*Myoxus quercinus*). From Spain. Presented by Lord Lilford, F.Z.S.
12 Glossy Ibises (*Plegadis falcinellus*). From Spain. Presented by Lord Lilford, F.Z.S.

Aug. 25. 4 Marbled Ducks (*Anas angustirostris*). From Spain. Presented by Lord Lilford, F.Z.S.
26. 2 Ypecaha Rails (*Aramides ypecaha*). Presented by F. H. Chalk, Esq.
28. 1 Feldegg's Falcon (*Falco feldeggi*). From Morocco. Presented by Lord Lilford, F.Z.S.
29. 2 White-shafted Francolins (*Francolinus leucoscepus*), 2 ♀. Presented by Lord Lilford, F.Z.S.
30. 2 Sun-Bitterns (*Eurypyga helias*), ♂ ♀. Purchased.
2 Common Buzzards (*Buteo vulgaris*). Presented by Mrs. Harry Goodbun.
1 Ring-Ouzel (*Turdus torquatus*), ♂. Presented by Mr. Samuel Radcliffe.
31. 3 Chilian Teal (*Querquedula creccoides*). Purchased.

Sept. 1. 4 Patagonian Cavies (*Dolichotis patachonica*), 2 ♂, 2 ♀. Bred in France. Purchased.
2 Viscachas (*Lagostomus trichodactylus*), ♂ ♀. Purchased.
1 Elliot's Pheasant (*Phasianus ellioti*), ♂. Purchased.
2 Sulphury Tyrants (*Pitangus sulphuratus*). Presented by H. H. Sharland, Esq., F.Z.S.
1 Chukar Partridge (*Caccabis chukar*). Presented by H. H. Sharland, Esq., F.Z.S.
1 Bamboo Partridge (*Bambusicola thoracica*). Presented by H. H. Sharland, Esq., F.Z.S.
1 Malayan Bear (*Ursus malayanus*), ♀. Presented by E. Sydney Woodiwiss, Esq.
2. 1 Arabian Baboon (*Cynocephalus hamadryas*), ♀. Deposited.
1 American Tapir (*Tapirus americanus*, jr.), ♂. From Colombia. Deposited.
1 Land-Rail (*Crex pratensis*). Presented by Mr. W. Stanley.
4. 1 Chilian Teal (*Querquedula creccoides*). Purchased.
1 Little Tern (*Sterna minuta*). Purchased.
6. 1 Sooty Mangabey (*Cercocebus fuliginosus*), ♀. Presented by Miss J. Grimston.
1 Axis Deer (*Cervus axis*), ♂. Purchased.
2 Brazilian Cariamas (*Cariama cristata*). Presented by Lindsay C. Scott, Esq.
7. 1 Melodious Jay-Thrush (*Leucodioptron canorum*). Presented by B. H. Jones, Esq., F.Z.S.
1 St. Thomas's Conure (*Conurus pertinax*). Purchased.
9. 1 Wall-Lizard (*Lacerta muralis*, var. *tiliguerta*). From Trieste. Presented by Mr. A. W. Arrowsmith.
11. 1 Campbell's Monkey (*Cercopithecus campbelli*), ♀. Presented by Miss Jane Richards.
1 Japanese Deer (*Cervus sika*), ♀. Born in the Menagerie.
12. 1 Pig-tailed Monkey (*Macacus nemestrinus*), ♂. Presented by Miss Llewellyn.
2 Egyptian Jerboas (*Dipus ægyptius*). Presented by Miss B. Dell.
13. 1 Azara's Capuchin (*Cebus azaræ*), ♀. Presented by Miss Hairby.
2 Collared Fruit-Bats (*Cynonycteris collaris*). Born in the Menagerie.
1 Wapiti Deer (*Cervus canadensis*), ♂. Born in the Menagerie.
14. 2 Egyptian Jerboas (*Dipus ægyptius*). Presented by M. W. Edgley, Esq.

Sept. 14. 1 Egyptian Jerboa (*Dipus ægyptius*). Presented by W. R. Clark, Esq.
1 African Buzzard (*Buteo desertorum*). Presented by Mr. Rice.
15. 2 Lions (*Felis leo*), ♂ ♀. From East Africa. Presented by H. H. The Sultan of Zanzibar.
1 Golden Eagle (*Aquila chrysaëtus*). From Scotland. Presented by Bryan Cookson, Esq.
16. 2 Common Marmosets (*Hapale jacchus*). Presented by E. Lake, Esq.
3 Tench (*Tinca vulgaris*). Presented by Arthur E. Rumsey, Esq.
20. 2 Hamsters (white varieties)(*Cricetus frumentarius*). Deposited.
1 Black-headed Caique (*Caica melanocephala*). Deposited.
1 Common Quail (*Coturnix communis*). Presented by Mrs Mazelin.
21. 1 Corean Sea-Eagle (*Haliaëtus branickii*). Purchased. See P. Z. S. 1893, p. 613.
2 Black-pointed Teguexins (*Tupinambis nigro-punctatus*). From Trinidad, W.I. Presented by Messrs. Mole and Urich.
1 Crowned Snake (*Scytale coronatum*). From Trinidad, W.I. Presented by Messrs. Mole and Urich.
1 Tree-Boa (*Corallus hortulanus*). From Trinidad, W.I. Presented by Messrs. Mole and Urich.
1 Clouded Snake (*Leptognathus nebulatus*). From Trinidad, W.I. Presented by Messrs. Mole and Urich.
1 Black-pointed Teguexin (*Tupinambis nigro-punctatus*). From Trinidad, W.I. Deposited.
1 Tree-Boa (*Corallus hortulanus*). From Trinidad, W.I. Deposited.
1 Boddaert's Snake (*Coluber boddaerti*). From Trinidad, W.I. Deposited.
23. 1 Golden Plover (*Charadrius pluvialis*). Purchased.
1 Leadbeater's Cockatoo (*Cacatua leadbeateri*). Presented by Miss Mercy Grogan.
25. 1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by Duncan Mackintosh, Esq.
4 Long-fronted Gerbilles (*Gerbillus longifrons*). From Tunis. Presented by Mons. Albert de Lautreppe.
2 Long-tailed Field-Mice (*Mus sylvaticus*). Presented by Mons. Albert de Lautreppe.
1 Secretary Vulture (*Serpentarius reptilivorus*). Deposited.
2 White Storks (*Ciconia alba*). Presented by Walter Winans, Esq., F.Z.S.
26. 1 Ring-tailed Coati (*Nasua rufa*). Presented by H. Rich, Esq.
1 Grey Squirrel (albino) (*Sciurus cinereus*). Deposited.
1 Alligator (*Alligator mississippiensis*). Presented by Mr. H. Venn.
27. 3 Viscachas (*Lagostomus trichodactylus*). Purchased.
1 Hairy Armadillo (*Dasypus villosus*), ♂. Purchased.
2 Ypecaha Rails (*Aramides ypecaha*). Purchased.
1 Great Grebe (*Æchmophorus major*). Purchased. See P. Z. S. 1893, p. 613.
1 Serval (*Felis serval*). From Beira, E. Africa. Deposited.
1 Cape Crowned Crane (*Balearica chrysopelargus*). From Beira, E. Africa. Deposited.
1 Black-winged Kite (*Elanus cæruleus*). Deposited.
28. 4 Indian Wild Swine (*Sus cristatus*). Born in the Menagerie.

Sept. 28. 3 Dwarf Chameleons (*Chamæleon pumilus*). Presented by Henry Beamish, Esq.

29. 2 Lions (young) (*Felis leo*), 2 ♀. From Somaliland. Presented by The Lord Delamere.

1 Adelaide Parrakeet (*Platycercus adelaidæ*). Presented by Mrs. Waterhouse.

1 Prêtre's Amazon (*Chrysotis prætrii*). Purchased.

2 Common Sheldrakes (*Tadorna vulpanser*). Presented by Francis Alexander, Esq.

Oct. 2. 2 Great Eagle-Owls (*Bubo maximus*). Deposited.

1 Yellow-collared Parrakeet (*Platycercus semitorquatus*). Presented by Miss A. Fenwick.

3. 1 Common Sheldrake (*Tadorna vulpanser*), ♂. Purchased.

4. 1 Flocky Lemur (*Avahis laniger*). Purchased.

1 Oyster-catcher (*Hæmatopus ostralegus*). Presented by E. Elliot, Esq.

5. 1 Sooty Mangabey (*Cercocebus fuliginosus*), ♂. Presented by S. C. Hopkins, Esq.

1 Puffin (*Fratercula arctica*). Purchased.

1 Goliath Beetle (*Goliathus druryi*). From Accra, West Africa. Presented by F. W. Marshall, Esq. See P. Z. S. 1893, p. 691.

6. 1 Sanderling (*Calidris arenaria*). Purchased.

7. 1 Lesser White-nosed Monkey (*Cercopithecus petaurista*), ♂. Presented by Mrs. Noakes.

1 Raccoon-like Dog (*Canis procynides*). Purchased.

1 Serval (*Felis serval*). From Mombasa, E. Africa. Presented by T. E. C. Remington, Esq.

1 Nilotic Monitor (*Varanus niloticus*). Presented by T. E. C. Remington, Esq.

9. 2 Sykes's Monkeys (*Cercopithecus albigularis*). From Mozambique. Presented by W. H. Barber, Esq.

1 Diamond Snake (*Morelia spilotes*). Presented by A. W. Darken, Esq.

10. 1 Ruddy-headed Goose (*Bernicla rubidiceps*), ♂. Presented by Henry Phillips, Esq.

2 Common Squirrels (*Sciurus vulgaris*) (albinos). Deposited.

11. 1 Thick-furred Capuchin (*Cebus vellerosus*), ♂. Presented by R. Kettle, Esq.

1 Molucca Deer (*Cervus moluccensis*). Born in the Menagerie.

2 Blue-winged Teal (*Querquedula cyanoptera*), ♂ ♀. Purchased.

1 Japanese Teal (*Querquedula formosa*), ♀. Purchased.

1 Impeyan Pheasant (*Lophophorus impeyanus*), ♀. Purchased.

1 Tuatera Lizard (*Sphenodon punctatus*). Presented by C. Stonham, Esq., F.Z.S.

12. 1 White-fronted Lemur (*Lemur albifrons*). Deposited.

1 Senegal Parrot (*Pœocephalus senegalus*). Presented by Mrs. Rylands.

1 Turnstone (*Strepsilas interpres*). Purchased.

1 Curlew (*Numenius arquata*). Purchased.

14. 3 Tigers (*Felis tigris*), 2 ♂, 1 ♀. From Hyderabad. Presented by H.R.H. Princess Beatrice.

16. 1 Wanderoo Monkey (*Macacus silenus*), ♀. From Cochin. Presented by Capt. Morgan.

1 Burchell's Zebra (*Equus burchelli*), ♀. Born in the Menagerie.

Oct. 18. 1 Black-headed Lemur (*Lemur brunneus*), ♀. Presented by Miss Hoare.
1 Kite (*Milvus ictinus*). From the Canary Islands. Presented by E. G. Meade-Waldo, Esq., F.Z.S.
1 Dunlin (*Tringa alpina*). Purchased.
19. 2 Manatees (*Manatus americanus*), ♀ et pull. From Manatee Bay, Jamaica, W. I. Presented by Sir Henry A. Blake, K.C.M.G. See P. Z. S. 1893, p. 691.
2 Ospreys (*Pandion haliaëtus*). From Hayti, W. I. Purchased.
1 Chacma Baboon (*Cynocephalus porcarius*), ♀. Presented by Capt. F. Baker.
2 Common Quails (*Coturnix communis*). Presented by Capt. F. Baker.
1 Rufous Rat-Kangaroo (*Hypsiprymnus rufescens*). Presented by Kenneth Crawley, Esq., R.N.
2 Purple Porphyrios (*Porphyrio cæruleus*). From Sicily. Presented by Joseph S. Whitaker, Esq., F.Z.S.
20. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by John Cook, Esq.
1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by Stanley Sinclair, Esq.
1 Kinkajou (*Cercoleptes caudivolvulus*). Purchased.
1 King Vulture (*Gypagus papa*, jr.). Purchased.
1 Common Boa (*Boa constrictor*). Purchased.
1 Turtle-Dove (*Turtur communis*). Presented by Miss Alice L. West.
2 Rufous-necked Weaver-birds (*Hyphantornis textor*). Purchased.
5 Yellowish Weaver-birds (*Sitagra luteola*). Purchased.
21. 1 Wapiti Deer (*Cervus canadensis*), ♀. Born in the Menagerie.
23. 2 White-handed Gibbons (*Hylobates lar*), 2 ♂. Deposited.
1 Yellow-crowned Bulbul (*Trachycomus ochrocephalus*). Deposited.
1 Chestnut-eared Finch (*Amadina castanotis*). Presented by Mrs. Kemp-Welch.
1 De Filippi's Meadow-Starling (*Sturnella defilippi*), ♂. Presented by Mrs. Kemp-Welch.
5 Green Lizards (*Lacerta viridis*). Deposited.
2 Green Lizards (*Lacerta viridis*, var. *schreiberi*). From Spain. Deposited.
2 Wall-Lizards (*Lacerta muralis*). Deposited.
2 Slowworms (*Anguis fragilis*). Deposited.
1 Common Frog (*Rana temporaria*). Deposited.
1 Edible Frog (*Rana esculenta*). Deposited.
4 Schlagintweit's Frogs (*Rana cyanophlyctis*). From Ceylon. Deposited.
3 Black-spotted Toads (*Bufo melanostictus*). From Ceylon. Deposited.
2 Common Toads (*Bufo vulgaris*). Deposited.
3 Fire-bellied Toads (*Bombinator igneus*). Deposited.
25. 2 Laughing Kingfishers (*Dacelo gigantea*). Presented by the Executors of the late Fred Burgess.
1 Punctured Salamander (*Amblystoma punctatum*). Presented by J. H. Thomson, Esq., Ph.D., C.M.Z.S.
26. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Robert Gallon, Esq.

Oct. 26. 4 Common Toads (*Bufo vulgaris*). From Jersey. Presented by J. Stanton, Esq.
28. 2 Dunlins (*Tringa alpina*). Purchased.
1 Bar-tailed Godwit (*Limosa lapponica*). Purchased.
1 Red-and-Yellow Macaw (*Ara chloroptera*). Deposited.
31. 1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by Miss G. A. Gollock.
1 Black-handed Spider-Monkey (*Ateles geoffroyi*). Presented by T. E. M. Rymer-Jones, Esq.
7 Common Quails (*Coturnix communis*). Presented by Mrs. Rickards.
1 Grey-headed Porphyrio (*Porphyrio poliocephala*). Presented by Mrs. Rickards.
2 Common Terns (*Sterna hirundo*). Presented by Mrs. Rickards.
2 Common Toads (*Bufo vulgaris*). Presented by Mrs. Rickards.
2 Bull Frogs (*Rana castesbiana*). Presented by Mrs. Rickards.

Nov. 1. 1 Philippine Deer (*Cervus philippinus*), ♀. Presented by Capt. T. C. Saunders.
2. 1 Bay Wood-Owl (*Phodilus badius*). Deposited.
3. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by W. Wylde, Esq.
1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by the Hon. Mrs. E. Yorke.
4. 2 Rose Hill-Parrakeets (*Platycercus eximius*). From Tasmania. Purchased.
1 Purple Sandpiper (*Tringa striata*). Purchased.
1 Smooth Snake (*Coronella lævis*). Presented by Mr. A. Green.
6. 1 White-handed Gibbon (*Hylobates lar*), ♀. Deposited.
1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by Mrs. B. E. F. Stevens.
1 Blossom-headed Parrakeet (*Palæornis cyanocephalus*), ♂. Presented by Mrs. Osmond Barnes.
2 Herring-Gulls (*Larus argentatus*). Presented by B. Tremble, Esq.
7. 2 Lapwings (*Vanellus vulgaris*). Purchased.
1 Common Curlew (*Numenius arquata*). Purchased.
2 Dingoes (*Canis dingo*). Born in the Menagerie.
9. 1 Hairy-nosed Wombat (*Phascolomys latifrons*), ♂. Presented by E. W. Marshall, Esq., F.Z.S.
2 Marabou Storks (*Leptoptilus crumeniferus*). Presented by E. W. Marshall, Esq., F.Z.S.
1 Javan Adjutant (*Leptoptilus javanicus*). Presented by E. W. Marshall, Esq., F.Z.S.
1 White-necked Stork (*Dissura episcopus*). Presented by E. W. Marshall, Esq., F.Z.S.
10. 1 Mona Monkey (*Cercopithecus mona*), ♂. Purchased.
2 Hedgehogs (*Erinaceus europæus*). Presented by Mr. W. Chatterton.
3 Hedgehogs (*Erinaceus europæus*). Presented by Mr. A. H. Bird.
11. 1 Bonnet-Monkey (*Macacus sinicus*), ♀. Presented by James Kendal, Esq.
13. 1 Mozambique Monkey (*Cercopithecus pygerythrus*), ♂. Presented by Mr. Bayes.

Nov. 14. 1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by Mr. C. E. Morres.
1 Tuatera Lizard (*Sphenodon punctatus*). Presented by Charles Smith, Esq.
15. 1 Lion (*Felis leo*), ♀. From West Africa. Deposited by H.M. The Queen.
1 Cunning Bassaris (*Bassaris astuta*). Purchased. See P. Z. S. 1893, p. 729.
16. 1 American Bison (*Bison americanus*), ♀. Deposited.
17. 2 Persian Jerboas (*Alactaga decumana*). Presented by Capt. R. A. Ogilby, F.Z.S. See P. Z. S. 1893, p. 729.
20. 1 Caucasian Wild Goat (*Capra caucasica*), ♀. From the Central Caucasus. Presented by H. H. P. Deasy, Esq. See P. Z. S. 1893, p. 729.
22. 1 Brown Capuchin (*Cebus fatuellus*), ♂. Deposited.
2 Common Marmosets (*Hapale jacchus*). Presented by Dr. S. Steggall.
1 Duyker Bok (*Cephalophus mergens*), ♂. Presented by Miss Gertrude A. Winby.
6 Meyer's Parrots (*Pœocephalus meyeri*). From the Transvaal. Deposited.
1 Alario Sparrow (*Passer alario*). From the Transvaal. Deposited.
1 Meyer's Parrot (*Pœocephalus meyeri*). From the Transvaal. Presented by Mrs. B. Searelle.
23. 1 Chacma Baboon (*Cynocephalus porcarius*), ♂. Presented by W. P. Cox, Esq.
1 Rhesus Monkey (*Macacus rhesus*), ♀. Deposited.
2 Triangular-spotted Pigeons (*Columba guinea*). Bred in the Menagerie.
24. 1 Great Eagle-Owl (*Bubo maximus*). Presented by Major Boyd Bredon.
3 Palm-Squirrels (*Sciurus palmarum*). Presented by Mrs. S. W. MacIver.
25. 2 Puffins (*Fratercula arctica*). Presented by E. Hammond, Esq.
2 Redshanks (*Totanus calidris*). Purchased.
27. 1 Northern Mocking-bird (*Mimus polyglottus*). Presented by Miss Dorothy Williams.
1 Viperine Snake (*Tropidonotus viperinus*). Presented by Miss Ffennell.
29. 1 Common Otter (*Lutra vulgaris*). Presented by C. B. C. de Vit, Esq.
1 Herring-Gull (*Larus argentatus*). Presented by J. G. Goodchild, Esq., F.Z.S.
1 Red Tiger-Cat (*Felis chrysothrix*). From Accra, West Africa. Presented by Wm. Adams, Esq.
30. 1 Mozambique Monkey (*Cercopithecus pygerythrus*), ♂. From Mombasa, East Africa. Presented by T. E. C. Remington, Esq.
1 Sykes's Monkey (*Cercopithecus albigularis*), ♂. From Mombasa, East Africa. Presented by T. E. C. Remington, Esq.
1 Bell's Cynixys (*Cynixys belliana*). From Mombasa, East Africa. Presented by T. E. C. Remington, Esq.

Dec. 1. 5 Barbary Partridges (*Caccabis petrosa*). Deposited.
6. 1 Collection of Marine Fishes. Purchased.

Dec. 7. 13 Rufous Tinamus (*Rhynchotus rufescens*). Purchased.
2 Alligators (*Alligator mississippiensis*). Presented by Austen E. Harris, Esq.
1 Pale-headed Parrakeet (*Platycercus pallidiceps*). Presented by C. B. Lawes, Esq.
9. 2 Leopards (*Felis pardus*). Deposited.
1 Chacma Baboon (*Cynocephalus porcarius*), ♀. Presented by Mrs. Rowland Tomson.
1 Japanese Deer (*Cervus sika*), ♀. Born in the Menagerie.
10. 2 Common Crossbills (*Loxia curvirostra*). Presented by Mr. H. C. Martin.
1 Song-Thrush (*Turdus musicus*). Presented by Mr. H. C. Martin.
11. 2 Arctic Foxes (*Canis lagopus*). Presented by the Duke of Hamilton, K.T., F.Z.S.
1 Red Kangaroo (*Macropus rufus*), ♀. Deposited.
12. 1 Ring-tailed Coati (*Nasua rufa*). Presented by Kenelm Chandler, Esq.
1 Moloch Lizard (*Moloch horridus*). Presented by Mr. John Carter.
2 Short-toed Eagles (*Circaëtus gallicus*). Deposited.
15. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Sir F. D. Dixon-Hartland, Bt., M.P.
18. 2 Adorned Ceratophrys (*Ceratophrys ornata*). Presented by Miss Mildred FitzHugh.
19. 1 Mona Monkey (*Cercopithecus mona*), ♀. Presented by Mrs. Francis Bell.
1 Mozambique Monkey (*Cercopithecus pygerythrus*). Deposited.
4 Bernicle Geese (*Bernicla leucopsis*), 2 ♂, 2 ♀. Presented by Sir Henry Peek, Bt., F.Z.S.
1 Variegated Sheldrake (*Tadorna variegata*). Presented by Sir Henry Peek, Bt., F.Z.S.
20. 6 Smooth-clawed Frogs (*Xenopus lævis*). Hatched in the Gardens.
21. 1 Little Auk (*Mergulus alle*). Presented by J. W. C. Stares, Esq.
22. 3 Black-backed Jackals (*Canis mesomelas*). Presented by J. Matcham, Esq.
24. 1 Bonnet-Monkey (*Macacus sinicus*). Presented by Henry Vine, Esq.
27. 1 Diamond Snake (*Morelia spilotes*). Presented by Commander A. Burgess, R.N.R.
1 Diamond Snake (*Morelia spilotes*). Purchased.
28. 1 Alligator (*Alligator mississippiensis*). Presented by C. Knox Shaw, Esq., F.Z.S.
30. 1 Leopard (*Felis pardus*) (black variety), ♂. From Malacca. Presented by the Duke of Newcastle, F.Z.S.
31. 1 Herring-Gull (*Larus argentatus*). Presented by Mr. John Stanton.

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